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long-run adjustments

IN THE LIVESTOCK AND MEAT INDUSTRY:

implications and alternatives

THOMAS T. STOUT, EDITOR

Agricultural Experiment Stations of Alaska, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin, and the U. S. Department of Agriculture cooperating.

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FOREWORD

This bulletin is the final part of a series of publications prepared by the North Central Regional Livestock Marketing Research Committee. The work was done as part of North Central Regional Project NCM-36, "Long-Run Adjustments in Livestock Market Organization in the North Central Region."

The research committee is composed of Federal and State researchers from the U.S. Department of Agriculture and the agricultural experiment stations of the North Central States and Kentucky. Their function over the years has been to work together in cooperative State-Federal research on problems of regional scope confronting the livestock and meat industry, such as the one that is cited above. The membership of the committee is fluid, being made up of researchers engaged in the research that is current. The research that is concluded with this document was a five year effort, divided into many parts and requiring effort by researchers working individually or in small groups to accomplish the total regional purpose. Individuals who participated in this effort, and therefore constitute membership of the regional committee for the NCM-36 project effort, are indicated below.

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This publication serves several purposes, all of them reflecting the growing need for more interpretive content to accompany the increasing output of research findings. Therefore, this document strives (1) to consolidate and summarize the individual research efforts of the NCM-36 committee representatives; (2) to relate these results to the larger body of research literature available through the efforts of others over the years and, by employing this broader perspective; (3) to interpret the collective results of this effort with reference to the implications and alternatives confronted by a changing livestock and meat industry.

As a consequence of this approach, numerous reference citations were made. These have been consolidated at the end of the volume into a bibliography of additional evidence bearing upon the observations, interpretations, conclusions and recommendations which are abundant in this bulletin.

The procedure employed in developing the bulletin was to have contributors make their initial presentations at a seminar where the atmosphere might demand defense against challenge, clarification in response to questions, and amendment as a result of discussion. Such a seminar occurred on November 7-8, 1968, at the Farm Foundation in Chicago. Participants included NCM-36 committee members and other researchers, together with representatives from industry and government. Seminar planning and preparation was a committee activity, coordinated by Thomas T. Stout and James M. Kendrick who were at that time Chairman and Vice-Chairman of the NCM-36 Committee.

The bulletin contains all but a few of the presentations made at the Chicago seminar, and many which are included here are substantially revised as a result of the seminar experience. Although aspects of NCM-36 research are recorded in a variety of regional and State publications, original contributions appear in this volume as well. But most unique to this publication is the interpretive mode of presentation which relates this work to the greater body of research literature and explains its meaning in the context of a changing industry. In the process, a unity of understanding is generated from many separate parts contributed by many separate people working at many separate locations.

Editorial work and manuscript preparation were done in the Department of Agricultural Economics and Rural Sociology at Ohio State University. Miss Malinda Brenner supervised and completed the demanding task of typing the camera-copy manuscript.

Thomas T. Stout
Editor

November, 1969

ORGANIZATIONAL CHANGES IN LIVESTOCK PRODUCTION

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The objective of this paper is two-fold (1) to set out production changes that appear to be associated with farm and market organizational developments and (2) to point out, or at least hypothesize with respect to, possible implications of these changes to livestock marketing. Discussion is confined to developments in primary livestock production, i. e., at the farm and ranch level. Among the production changes which appear to have major marketing implications are: commercial feeding operations (both finishing and growing), preconditioning, integration, performance testing and related activities, confinement feeding and environmental control systems and, finishing bulls for slaughter. Other factors more or less related to production but of less apparent relationship to marketing are developments in mechanization, nutrition, disease and parasite prevention and control, management, and form of farm and ranch ownership.

Commercial Feeding

The term "commercial" is rather loosely defined in livestock operations other than cattle finishing. In general commercial livestock enterprises are construed to be relatively large, specialized operations.

The most obvious development in commercial feeding has been in the cattle sector, particularly in the finishing phase. Despite its relatively recent origin, i. e., largely since World War II, Willard Williams saw fit to label commercial cattle feeding as an "industry" in his 1966 study for the National Commission on Food Marketing.(158) Substantial growth has occurred since that time.

From a structural standpoint, commercial feeding is an example of concentration of production. Concentration has been accompanied by an overall rapid growth in the industry. Table 1 is a summary of the number and size distribution of cattle finishing firms in the U. S., 1962-1967. Certain states have similar information for longer periods. Over the United States as a whole, the total number of cattle feeders declined from 235,000 in 1962 to 210,000 in 1967. During this period the number of feeders in every size group over 1000 head increased, but the decline in farm feeding operations (i. e., under 1000 head) exceeded the increase in larger feeders. At the same time the number of fed cattle marketed tended to increase in all size classifications, including farm feeders.

Data in Table 2 show the trend in cattle feeding in Kansas by size classifications with a somewhat more detailed breakdown in what might be called farm feeding operations.1/ From the standpoint of numbers of cattle fed, it appears that, in general all size classifications participated in the

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1/ Detailed examination of the data not shown here indicate that adjustment for cyclical movement would change conclusions presented.

expansion of feeding operations from 1940 to the early 1960's. While the industry continued to expand after that time, all the expansion occurred in lots of 400 head or more. This, of course, included the large commercial lots.

The lower half of Table 2 shows trends in number of producing units, i.e., in number of farmers and feedlot operators. The trend in number of producing units appears to be consistent with trends in number of cattle fed (upper half of Table 2) in all size classifications except the 101-200 and 201-399 categories since the early 1960's. During this period, the number of cattle fed by them declined from 1963 to 1967. This could occur if operators in the upper end of these ranges were replaced by operators in the lower end of the size ranges. The data do not permit this sort of detailed examination.

While the number of feedlots in operation remains relatively large, it may be worthy of note that on January 1, 1968, approximately 69 percent of the cattle on feed in 16 important cattle feeding states were held by three percent of the feedlot operators.

Less information is available on concentration in the swine industry, but census data indicate a definite trend toward larger operations. Data from the 1964 census are the latest available at this time, and it is presumed the trend has accelerated. In 1964, farms producing 200 to 500 hogs accounted for 11.8 percent of all farms, but sold 32.8 percent of the hogs. Farms raising 500 head or more accounted for but 2.7 percent of all hog farms and produced 21.4 percent of all hogs marketed. The number of farms and percentage of hogs marketed in these size classifications were substantially higher in 1964 than was the case in 1959. Data in Table 3 illustrate the trend toward larger hog production units in Kansas. No definite trend was observable in Kansas hog numbers until the mid 1950's when a definite increasing trend set in. While data in Table 3 are not adjusted for trend or cyclical effect, it is apparent that in both number of producing units and number of hogs produced the smaller sized operations are declining in both an absolute and relative sense.

While a strong tendency toward concentration exists, Williams has aptly pointed out (158) that the cattle finishing industry still is highly competitive. At the same time, it is recognized that in some respects the increase in size of operation has been accompanied by a change in market conduct.2/ Operators of large, specialized firms tend to utilize direct marketing channels to a greater extent than farm feeders. The manager of a well operated, progressive feedlot must have an ever current familiarity, not only with technological developments in feed processing and handling, nutrition, disease and parasite control, record keeping and analysis, but he

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2/ The term "conduct" is used here in a broader sense than the conventional behavior in changing output, prices, selling expense, product characteristics, etc.

must also be familiar with conditions in input and output markets.[3/] Characteristics such as these, together with some economies of scale are presumed to give commercial operators an economic advantage relative to farm feeders.[4/] Although believed to be not widespread at this time, it has been observed in Kansas that farm feeders in the vicinity of commercial lots solicit marketing advice from commercial operators.

Commercilaization in cattle feeding is not limited to the finishing phase. A practice commonly called "backgrounding" appears to be growing rapidly, although the extent has not been accurately determined. Backgrounding, basically is a growing program used on feeder cattle prior to the finishing phase. To a limited extent, this program has been used by farm feeders for a number of years. It is now being carried out by some commercial operators. As is the case with commercial finishers, operators of backgrounding yards typically sell the feeder cattle directly to finishers.

Preconditioning

Preconditioning is not to be confused with backgrounding. Preconditioning, generally is designed to prevent stress as well as virus and bacterial infection in replacement cattle. The same notion applies to feeder pigs and lambs. There is far from unanimous agreement on the program. There also is a lack of unanimity on the economics of preconditioning feeder livestock. This is particularly the case with cattle. Among the practices performed in preconditioning are weaning, dehorning, castrating, and immunizing for various diseases. Recent production oriented publications devote considerable space to preconditioning, but an obvious feature of the present situation is a need for specification of acceptable standards that might constitute preconditioning. It is clear that the industry demands more than mere blackleg vaccination, for example. There appears to a general consensus that preconditioning represents value added to feeder cattle. To some extent, the value of perconditioning becomes compounded and confounded with so-called "reputation" selling. However, reputation is a broader term involving such additional aspects as expected feed efficiency and carcass characteristics. Most preconditioned cattle are marketed by direct sales. A major question among producers is the equity of distribution between seller and buyer of the value added.

Integration

Integration in livestock production can be vertical or horizontal and can be accomplished by ownership or contract. Most interest and controversy centers in vertical integration. These activities may be classified as forward integration. (i.e., a primary grower engaging in finishing, a finisher engaging in packing, a packer engaging in retailing, or any successive combination which proceeds toward retailing), or its inverse, backward integration. There are numerous examples of cow-herd operators who grow out feeder cattle and finish them to slaughter condition. There are

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3/ It is recognized that consultant services are available, but these will not replace capable management.

4/ (158), pp. 17-20.

examples of finishers who have extended their operations to meat packing. Retailing by meat packers is done, but not extensively. Major packers under the Consent Decree are expressly prohibited from retailing specified products.

In backward integration, packing and feeding operations by retailers have, on occasion, attracted considerable publicity. An adverse effect on public relations was reported as a reason for Safeway's cessation of slaughtering in the late 1950's. The National Commission on Food Marketing reported that:

> "Cattle slaughtered by major food chains rose from 1.2 percent of U. S. commercial slaughter in 1950 to 2.3 percent in 1964. These chains also have been slaughtering an increasing share of other species of livestock, although the volume of hogs slaughtered has been relatively small.
>
> The number of cattle fed by the three chains has shown a gradual rising trend, amounting to 64,000 head in 1964. This was 8.5 percent of beef and veal production by these chains, 0.2 percent of U. S. commercial beef and veal production and 0.4 percent of fed cattle marketings in 39 states." (86)

In the cattle industry, feeding of cattle by packers has aroused interest to the extent that national legislative action has, on occasion, been proposed (but not enacted) to limit or prohibit such activity. Data in Table 4 show the extent of cattle feeding by meat packers. The proportion of fed cattle produced by packers in increasing and amounted to slightly more than seven percent in 1966. The proportion is higher when associated packer interests are included with explicit packer feeding. In 1965, for example, feeding by packers and packer associated interests amounted to 11.5 percent compared to 6.8 percent for packer feeding (Table 4). It probably is an understatement that the impact of packer feeding on livestock prices is a controversial subject.

It is presumed that reported feedings by packers includes those packing plants which were built or acquired in forward integration by interests which formerly were exclusively in the feeding business. Once such integration has been effected, it may be an academic question whether the initiative came as a forward or backward move. Nevertheless, there does seem to be a prevailing impression that reported packer feeding represents entirely backward integration of established packers into feeding. It might be of interest to know what proportion originated from forward integration of feeding interests into meat packing.

To the extent that vertical integration is accomplished by ownership, marketing between integrated production stages, in the traditional sense, is eliminated. Where integration is accomplished by contracting the determination of value and application of bargaining become matters of private treaty. A considerable body of literature exists on the pros and cons of contracting. Advocates stress the growing importance of processors' need

for specific quality characteristics and some degree of control over delivery. Both of these characteristics can be enhanced by contracting. There appears to be a consensus among marketing personnel that livestock production and its movement through marketing processes must eventually be subject to a greater degree of management in quality control and scheduling time of delivery as well as numbers delivered. This could come about through integrative contracting or integrative ownership.

Production Performance Related Activities

A number of production activities related to performance currently are in various stages of adoption or exploration. This is not intended to be an exhaustive list. Artificial insemination, well established in use among dairy producers is currently used, but a lesser extent in beef cattle, swine, and sheep. Indirectly related to A. I. are developments in estrus synchronization. The perfection of estrus synchronization would facilitate artificial insemination particularly in beef cattle and sheep. This, in turn, would enhance breeding improvement programs which are directly related to quality control programs as well as other performance characteristics.

The SPF program in swine production ranks as another important herd improvement activity.

Cross breeding or hybridization currently is drawing increasing attention. Fertile egg transplantation, currently in the experimental stage, holds tremendous potential for quality improvement programs.

Along with the above breeding developments could be mentioned numerous nutritional and disease and parasite control measures. Also, management practices and techniques associated with the general area of performance improvement probably should be noted. Insofar as these developments are associated with quantity and quality of meat produced, they are related to marketing problems.

Confinement Feeding

Confinement feeding is utilized both in growing and finishing operations. To date, its use is more extensive in swine production than in other species. Experimental efforts have been carried out on confined beef cow herds. However, only limited use is reported on a commercial basis. Confinement finishing of beef cattle and lambs also is limited at this time. From a marketing standpoint per se, confined production does not appear to present anything new or different from other production practices previously discussed. It is, however, closely associated with performance testing and the entire quality improvement and control effort.

Finishing Bulls for Slaughter

The finishing of young bulls for slaughter has attracted interest in recent years. Official data are not available on the extent of its use. Production oriented publications carry an occasional article on the practice but general evidence indicates very limited production. Relatively high feed-

ing efficiency is reported, particularly in rate of gain, but adverse reaction to "bull" beef is a deterrent to consumer acceptance. Perhaps it is the consumer acceptance aspect which would qualify this production practice for some attention by a livestock and meat marketing research committee.

In summary, an attempt has been made to note some of the more current developments in livestock production that appear to have relevance in marketing. As anyone associated with the industry well knows, livestock production and marketing are highly dynamic. Observations made at this time probably will be out of date in the near future. A high degree of interrelationship exists between production and marketing. On the surface, it would appear that the development of commercial cattle finishing resulted in, or caused, a change in some marketing practices. On the other hand, demand at the ratail level for greater uniformity in quality and delivery undoubtedly are exerting pressures for change in the production sector. The direction of force for change may be irrelevant, but recognition of these interrelationships is important.

Table 1. Number of cattle feedlots by size group and number of fed cattle marketed by each size group, 32 states combined, 1962-1967.

	Feedlot Capacity																	
	Under 1,000		1,000 - 1,999		2,000 - 3,999		4,000 - 7,999		8,000 - 15,999		16,000 - 31,999		32,000 - and more		Total 1,000 & more		Total all feedlots	
Year	No. lots	No. cattle	No. lots	No. cattle	No. lots	No. cattle	No. lots	No. cattle	No. lots	No. cattle	No. lots	No. cattle	No. lots	No. cattle	No. lots	No. cattle	No. lots	No. cattle
	(1000)	(1000 head)	(No.)	(1000 head)	(No.)	(1000 head)	(No.)	(1000 head)	(No.)	(1000 head)	(No.)	(1000 head)	(No.)	(1000 head)	(No.)	(1000 head)	(1000)	(1000 head)
1962	235	NA	801	893	385	839	194	1,141	106	1,523	26	862	5	314	1,517	5,572	236	NA
1963	231	NA	807	948	399	969	227	1,286	111	1,568	28	915	7	432	1,579	6,118	232	NA
1964	223	11,094	826	1,043	435	1,147	244	1,377	119	1,772	36	1,153	8	558	1,668	7,050	225	18,144
1965	220	10,777	895	1,091	459	1,247	250	1,523	131	1,814	44	1,571	8	695	1,787	7,941	222	18,718
1966	315	11,336	938	1,182	486	1,493	298	1,781	136	1,959	55	1,895	8	716	1,921	9,026	217	20,362
1967	210	11,825	960	1,209	510	1,462	313	1,947	153	2,166	59	2,124	13	946	2,008	9,854	212	21,679

Source: Number of Cattle Feedlots by Size Groups and Number of Fed Cattle Marketed, 1962-1967. U.S.D.A., SRS, July, 1968.

Table 2. Number and percentage of producing units and grainfed cattle markets by size of operation; Kansas, 1940, 1950, 1960, 1963, and 1967.

	Size of Operation	1940		1950		1960		1963		1967	
	(head)	Cattle Marketed (number)	(percent)	Cattle Marketed (number)	(percent)	Cattle Marketed (number)	(percent)	Cattle Marketed (number)	(percent)	Cattle Marketed (number)	(percent)
Grainfed Cattle	1 - 25	88,452	23.40	98,784	23.52	114,853	13.56	95,734	9.04	54,577	3.89
	26 - 50	60,707	16.06	79,044	18.82	130,862	15.45	119,561	11.28	73,657	5.25
	51 - 100	65,772	17.40	82,068	19.54	164,742	19.45	147,942	13.96	102,279	7.29
	101 - 200	61,349	16.23	73,710	17.55	155,086	18.31	155,461	14.68	133,566	9.52
	201 - 399	41,202	10.90	27,804	6.62	98,676	11.65	126,762	11.97	113,222	8.07
	400 or more	60,518	16.01	58,590	13.95	182,783	21.58	413,857	39.07	925,699	65.98
	TOTAL	378,000	100.00	420,000	100.00	847,000	100.00	1,059,000	100.00	1,403,000	100.00
		Operators (number)	(percent)	Operators (number)	(percent)	Operators (number)	(percent)	Operators (number)	(percent)	Operators (number)	(percent)
Producing Units	1 - 25	12,281	77.58	9,799	72.05	9,408	57.02	7,920	52.80	6,035	48.42
	26 - 50	1,991	12.58	2,058	15.13	3,376	20.46	3,234	21.56	2,752	21.17
	51 - 100	899	5.69	1,093	8.04	2,147	13.01	1,968	13.12	1,907	14.67
	101 - 200	422	2.67	484	3.56	1,058	6.41	1,086	7.24	1,241	9.55
	201 - 399	154	.97	110	.81	351	2.13	486	3.24	571	4.39
	400 or more	82	.51	56	.41	160	.97	306	2.04	494	3.80
	TOTAL	15,830	100.00	13,600	100.00	16,500	100.00	15,000	100.00	13,000	100.00

Source: Calculated from data assembled by the Kansas Crop and Livestock Reporting Service.

Table 3. Number and percentage of producing units and hogs produced, by size of operation, Kansas[a/] 1940, 1950, 1960, 1963, and 1967.

	Size of Operation	1940		1950		1960		1963		1967	
	(head)	Hogs produced (number)	(percent)	Hogs produced (number)	(percent)	Hogs Produced (number)	(percent)	Hogs produced (number)	(percent)	Hogs produced (number)	(percent)
Hogs	1 - 25	695,794	36.64	436,000	20.00	91,863	5.19	51,960	2.29	32,546	1.89
	26 - 50	594,957	31.33	622,810	28.53	221,604	12.52	134,098	5.91	96,604	5.61
	51 - 75	235,096	12.38	380,934	17.45	205,143	11.59	146,351	6.45	108,314	6.29
	76 - 150	239,084	12.59	447,733	20.51	401,259	22.66	313,349	13.81	294,806	17.12
	151 - 300	98,178	5.17	242,750	11.12	582,507	32.91	965,008	42.52	455,125	26.43
	More than 300	35,891	1.89	52,174	2.39	267,801	15.13	658,464	29.02	734,605	42.66
	TOTAL	1,899,000	100.00	2,183,000	100.00	1,770,000	100.00	2,269,000	100.00	1,722,000	100.00
		Operators (number)	(percent)	Operators (number)	(percent)	Operators (number)	(percent)	Operators (number)	(percent)	Operators (number)	(percent)
Producing Units	1 - 25	59,069	70.32	34,029	53.17	10,210	27.89	6,194	18.78	3,511	16.72
	26 - 50	17,640	21.00	17,536	27.40	9,424	25.47	6,329	19.18	4,074	19.40
	51 - 75	3,998	4.77	6,304	9.85	5,295	14.31	4,099	12.42	2,764	13.16
	76 - 150	2,663	3.17	4,666	7.29	6,316	17.07	5,392	16.34	4,586	21.84
	151 - 300	544	.66	1,344	2.10	4,821	13.03	8,705	26.38	3,810	18.14
	More than 300	67	.08	122	.19	825	2.23	2,277	6.90	2,255	10.74
	TOTAL	84,000	100.00	64,000	100.00	37,000	100.00	33,000	100.00	21,000	100.00

a/ Hog production refers to pigs born and raised to weaning age or living December 1.

Source: Calculated from data assembled by the Kansas Crop and Livestock Reporting Service.

Table 4. Number of meat packers feeding cattle and extent of feeding, 39 states, 1954-1966.

Year	No. packers feeding cattle	No. of cattle fed by packers and packer-associated interests		Total fed cattle marketings 39 states	Percent of cattle fed by packers and packer-associated interests	
		(1,000 head)	(1,000 head)	(1,000 head)	(percent)	(percent)
1954	165	564.9	NA	9,482	6.0	-
1955	161	545.8	NA	10,762	5.1	-
1956	157	520.8	NA	11,331	4.6	-
1957	151	557.6	NA	11,285	4.9	-
1958	176	729.1	NA	11,787	6.2	-
1959	157	617.0	NA	12,843	4.8	-
1960	165	856.7	NA	13,621	6.3	-
1961	206	919.2	1,251.2	14,561	6.3	8.8
1962	215	981.4	NA	15,434	6.4	-
1963	211	1, 175.6	NA	16,808	7.0	-
1964	190	1,126.8	NA	18,319	6.2	-
1965	204	1,291.4	2,059.2	18,936	6.8	11.5
1966	202	1,473.7	NA	20,597	7.2	-

GEOGRAPHIC CHANGES IN LIVESTOCK PRODUCTION

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Historically, firms engaged in processing and marketing of livestock and livestock products have sought out optimal sites for their operations. These firms have operated within narrow profit constraints, making it imperative that they fulfill their marketing functions with efficiency and dispatch. This paper utilizes contour maps to identify geographic areas of varying densities of livestock marketing, depicting recent trends and projections for the major livestock producing areas of the United States. It will then trace the implications of these production changes as they affect marketing agencies.

Major emphasis focuses on the Corn Belt and environs composed of 13 states in the North Central Region. In addition, data from selected states in the West and South are presented to give a more complete picture of the livestock sector.

Data were obtained from the United States Census of Agriculture for the years 1949, 1954, 1959, and 1964 for four classes of livestock: cattle, calves, hogs and pigs, and sheep and lambs. Density figures were prepared for each county in the North Central Region by dividing the number of animals sold alive by the number of rural square miles. Isopleth lines were drawn to connect points of the same numerical ratio or density.

The use of census data involves one important limitation. Livestock production is subject to cyclical fluctuation of varying lengths and magnitude. Unless these cycles uniquely coincide with the census periods, no true indication of trends in livestock numbers is given. It is hoped, however, that this limitation does not prevent their use in identifying areas where marketings are increasing or decreasing for any given census period. It is assumed that marketings (animals sold alive) reflect the actual production of any particular class of livestock.

Changes in Cattle Marketings

Cattle production in the United States increased from 20.7 million head in 1949 to 34.6 million in 1964 (Table 1). The North Central region marketed approximately 55 percent of this total. Major cattle marketing states (in 1964) are Iowa (11 percent of United States total), Nebraska, and California (with 9 percent each), Kansas (7 percent), Texas and Illinois (6 percent), followed by Colorado, Minnesota, and South Dakota (with about 4 percent each). California has increased marketings 260 percent over the 15-year period, while Arizona's increase was 289 percent.

Visual comparison of Figures 1 through 4 reflects a number of important changes in the location of cattle production as revealed in marketings.

1/ This paper is a summary of a Master's Thesis by Ronald G. Fraase, who supplied the contour maps for this presentation.

First of all, the trend in cattle numbers is upward. Comparing the relatively small areas in the highest density class in Figure 1 with the steady increase in the size of these areas in Figures 2, 3, and 4, indicates that production has intensified in Eastern Nebraska, Western Iowa, Eastern Iowa, and Northern Illinois. It is also of interest to notice that by 1964, some small areas of high intensity are showing up in Kansas and Missouri, reflecting the increase in large feedlots in these states. Figure 5 graphically portrays the changes in concentration of cattle sales during the period. Large areas of the Dakotas have experienced and overall decline in concentration of cattle, as have widely scattered areas of Kansas, Kentucky, and Michigan.

Large areas of the North Central Region did not maintain the national rate of increase in cattle marketings (Figure 5). For the United States as a whole, cattle marketings increased 167 percent in 1964 over 1949. Wide areas of the North Central Region fell below this pace. The implications for marketing firms are clear. Those firms attempting to locate near the sources of cattle will not expand their operations in these areas of decreasing concentration. Figure 5 shows numerous small areas of one or two counties where this happened. On the other hand, where the percentage increase exceeds the national average, marketing firms and agencies will likely increase their attention for two reasons. First, they give evidence of sustained growth, and secondly, many of these areas are already in one of the higher density categories, which should tend to reduce assembly and precurement costs.

Table 1. Cattle Sold Alive and Percent at United States Total, Selected States, Selected Years, in Thousands

States	CENSUS YEARS								1964 as a % of 1949
	1949		1954		1959		1964		
	Number Sold	% of US Total	Number Sold	% of US Total	Number Sold	% of US Total	Number Sold	% of US Total	
Illinois	1,204	6	1,550	6	1,892	6	1,901	6	158
Indiana	518	3	646	3	709	2	752	2	145
Iowa	2,056	10	2,656	11	3,612	12	3,951	11	192
Kansas	1,388	7	1,388	6	1,906	6	2,472	7	178
Kentucky	386	2	359	1	465	2	462	1	119
Michigan	318	2	384	2	402	1	530	2	166
Minnesota	809	4	884	4	1,148	4	1,484	4	184
Missouri	910	4	953	4	1,151	4	1,140	3	125
Nebraska	1,474	7	1,908	8	2,326	8	3,278	9	222
North Dakota	417	2	402	2	407	1	486	1	116
Ohio	460	2	604	3	710	2	790	2	172
South Dakota	816	4	841	3	941	3	1,213	4	149
Wisconsin	552	3	585	2	651	2	785	2	142
N C Region	11,308	55	13,160	54	16,320	55	19,244	56	170
West									
California	1,169	6	157	6	2,212	7	3,042	9	260
Washington	227	1	289	1	392	1	572	2	251
Mountain									
Colorado	822	4	934	4	1,157	4	1,494	4	182
Montana	617	3	620	3	580	2	678	2	110
Arizona	274	1	399	2	612	2	792	2	289
Wyoming									
South									
Texas	1,460	7	1,420	6	2,008	7	2,118	6	145
Oklahoma	618	3	683	3	765	3	853	2	138
Georgia	156	1	269	1	296	1	316	1	203
Tennessee	274	1	303	1	322	1	330	1	121
U. S. Total	20,692	---	24,223	---	29,514	---	24,606	---	167

Table 2. Density of Cattle Sales, Rank, and Percent Change, Selected States, Selected Years

States	CENSUS YEARS 1949 Sales per Rural Square Mi.	Rank	1954 Sales per Rural Sq. Mile	Rank	1959 Sales per Rural Sq. Mile	Rank	1964 Sales per Rural Sq. Mile	Rank	1964 as a % of 1949
N C Region									
Illinois	24.9	2	32.6	2	39.9	2	40.6	4	163
Indiana	16.9	6	21.5	5	24.3	6	26.8	8	159
Iowa	38.4	1	49.9	1	68.3	1	74.9	1	195
Kansas	18.3	5	17.8	8	24.3	7	31.5	5	172
Kentucky	12.7	12	12.7	13	17.5	12	18.2	14	143
Michigan	11.8	13	14.9	12	17.4	13	24.9	10	211
Minnesota	15.7	8	17.5	9	23.9	8	30.8	6	196
Missouri	16.6	7	17.8	7	22.2	9	22.3	12	134
Nebraska	19.9	4	25.7	4	31.2	4	43.9	3	221
North Dakota	6.5	19	6.1	22	6.3	21	7.5	22	115
Ohio	14.0	10	19.3	6	24.6	5	28.7	7	205
South Dakota	11.7	14	12.0	15	13.4	16	17.0	15	145
Wisconsin	15.2	9	16.6	10	19.7	10	24.7	11	163
West									
California	20.4	3	26.6	3	38.4	3	52.6	2	257
Washington	8.4	17	10.5	17	13.4	15	19.2	13	229
Mountain									
Colorado	13.9	11	15.6	11	19.1	11	25.0	9	181
Montana	6.7	18	6.5	19	6.0	22	6.6	21	99
Arizona	4.4	21	6.1	21	9.8	18	12.5	18	285
Wyoming									
South									
Texas	6.4	20	6.2	20	9.0	20	9.6	20	149
Oklahoma	10.9	15	12.3	14	13.7	14	15.1	16	138
Georgia	3.9	22	7.2	18	9.6	19	11.3	19	292
Tennessee	9.5	16	11.0	16	12.8	17	13.8	17	146
U. S. Total	11.4	---	13.4	---	16.8	---	20.0	---	175

Changes in Calf Marketings

The total number of calf marketings nearly doubled in the United States from 1949 to 1964, increasing from 15.6 million to 28.3 million. By far the most important state in calf marketings is Texas, which markets 14 percent of the United States total (Table 3). As far as density of production goes, however, Wisconsin and Kentucky far surpass most of the other states with over 30 calves marketed per square mile (Table 4). The intensity of marketings in these states is closely associated with the dairy enterprises in these states. It is customary for dairymen to keep only those calves that will go into the breeding herd, and sell all others at a young age. Figure 9 pinpoints the areas of the North Central Region where heavy calf marketings occur. These areas of high densities have expanded significantly during the 1949-1964 period.

Another facet of change is observable from data in Figure 10. The western parts of the plains states of Kansas, Nebraska, and the Dakotas all exhibit substantial increases in concentration of calf sales. To some extent, this indicates the degree of specialization that is occurring as farmers and ranchers specialize in cow-calf operations. The calves are then sold to the feedlot operators who bring them up to slaughter weights. Some of this area is included in the area where cattle marketings showed a decline. There is likely a certain amount of double counting here, as we count calf marketing and then count them again as they are sold as slaughter animals by a Corn Belt feeder.

It is helpful in our analysis to have calves separated from cattle in the data. Analysis of the contour maps indicates that the outlying areas of the North Central Region are experiencing an increase in the number of calves marketed. This is especially true in the plains area of North and South Dakota, Nebraska, and Kansas. This is an indication that farmers and ranchers are specializing to an increasing degree by operating a cow-calf enterprise, selling the calf to a feeder in the Corn Belt for feeding to slaughter weight.

Also, of interest is the changing configuration around the urban and industrialized areas of Northern Ohio, Southern Michigan, Northern Illinois, and Southern Wisconsin. The higher land prices, lack of adequate land, and higher taxes on land are all factors associated with a definite decrease in the number of calves sold in these areas.

There is no doubt that a significant impact is created on marketing firms and agencies by these changes in location of livestock production. Marketing firms have tended to locate near the sources of supply, and with the changes just described, it is likely that firms engaged in the slaughter of livestock will not move out of the Corn Belt where cattle marketings appear to reach the highest density. Likewise, there will be no additional expansion into the fringe areas. However, firms engaged in the buying and selling of feeder cattle (auction sales, rings, and other order buyers), and the firms engaged in transporting these livestock from producers to feedlot operators will undoubtedly increase.

Table 3. Calves Sold Alive and Percent of United States Total, Selected States, Selected Years, in Thousands

	CENSUS YEARS								1964 as a % of 1949
	1949		1954		1959		1964		
	Number Sold	% of US Total	Number Sold	% of US Total	Number Sold	% of US Total	Number Sold	% of US Total	
Illinois	540	3	583	3	591	3	763	3	141
Indiana	377	2	401	2	383	2	473	2	125
Iowa	651	4	757	4	870	4	1,191	4	183
Kansas	589	4	944	5	905	4	1,448	5	246
Kentucky	446	3	482	2	529	2	787	3	176
Michigan	371	2	362	2	341	2	350	1	94
Minnesota	602	4	559	3	654	3	721	3	120
Missouri	703	5	873	44	924	4	1,295	5	184
Nebraska	462	3	744	4	813	4	1,130	4	245
North Dakota	211	1	292	1	511	2	645	2	305
Ohio	466	3	470	2	452	2	481	2	103
South Dakota	343	2	524	3	770	4	946	3	276
Wisconsin	1,116	7	1,198	6	1,194	6	1,218	4	109
N C Region	6,877	44	8,189	41	8,937	41	11,448	40	166
West									
California	523	3	659	3	731	3	924	3	178
Washington	137	1	192	1	246	1	343	1	250
Mountain									
Colorado	268	2	438	2	453	2	626	2	233
Montana	339	2	488	2	609	3	742	3	219
Arizona	112	1	159	1	237	1	231	1	206
Wyoming									
South									
Texas	1,992	13	2,486	12	2,646	12	3,995	14	201
Oklahoma	630	4	947	5	1,024	5	1,588	6	252
Georgia	158	1	305	2	306	1	449	2	284
Tennessee	405	3	494	2	516	2	729	3	180
U. S. Total	15,637	---	20,128	---	21,737	---	28,346	---	181

Table 4. Density of Calf Sales, Rank and Percent Change, Selected States, Selected Years

States	CENSUS YEARS								1964 as a % of 1949
	1949 Sales per Rural Sq. Mile	Rank	1954 Sales per Rural Sq. Mile	Rank	1959 Sales per Rural Sq. Mile	Rank	1964 Sales per Rural Sq. Mile	Rank	
N C Region									
Illinois	11.2	10	12.3	10	12.5	12	16.3	12	146
Indiana	12.3	7	13.3	9	13.2	10	16.9	10	137
Iowa	12.2	8	14.2	7	16.5	6	22.6	6	185
Kansas	7.8	14	12.1	11	11.6	14	18.4	7	236
Kentucky	14.7	2	17.1	3	19.9	3	31.0	2	211
Michigan	13.8	5	14.1	8	14.8	8	16.5	11	120
Minnesota	11.7	9	11.1	13	13.6	9	15.0	16	128
Missouri	12.8	6	16.3	5	17.8	5	25.3	5	198
Nebraska	6.2	15	10.0	15	10.9	16	15.1	15	244
North Dakota	3.3	21	4.5	21	7.9	19	9.9	20	300
Ohio	14.2	3	15.0	6	15.6	7	17.5	9	123
South Dakota	4.9	17	7.5	17	11.0	15	13.3	17	271
Wisconsin	30.8	1	34.1	1	36.1	1	38.2	1	124
West									
California	9.1	12	11.2	12	12.7	11	16.0	14	175
Washington	5.1	16	7.0	19	8.4	18	11.5	18	228
Mountain									
Colorado	4.5	18	7.3	18	7.5	20	10.5	19	231
Montana	3.7	20	5.1	20	6.1	21	7.2	21	197
Arizona	1.8	22	2.4	22	3.8	22	3.7	22	203
Wyoming									
South									
Texas	8.8	13	10.9	14	11.8	13	18.1	8	206
Oklahoma	11.2	11	17.0	4	18.3	4	28.2	4	321
Georgia	3.9	19	8.1	16	10.0	17	16.1	13	408
Tennessee	14.0	4	17.9	2	20.5	2	30.6	3	218
U. S. Total	8.6	---	11.1	---	12.4	---	16.3	---	190

Changes in Swine Marketing

Many of the same generalities that have been said about cattle and calves may be restated with respect to hogs and pigs. Unfortunately, census data do not provide a breakdown of the marketings of slaughter hogs and feeder pigs, to show the specialization that is occurring between producers (in Northern Minnesota and parts of Wisconsin, for example) who raise feeder pigs for eventual resale to farmers in the Corn Belt for feeding to slaughter weight. To the extent this trend is present in hogs and pigs, as it is with cattle and calves, marketing agencies performing the functions of merchandising feeder pigs are likely going to experience an increasing volume of business.

A number of observations can be made from the census data plotted on the contour maps (Figures 11 - 15). Here again, the impact of heavy production of feed grains is clearly associated with the increase we observe of marketings of hogs and pigs.

The contour maps show rather vividly the concentric circles of decreasing density as we leave the Corn Belt. Two large areas of high density of production are centered in Iowa and Indiana in 1949. These areas expand in a uniform manner and show some tendency of merging by 1964. Meanwhile, the fringe areas remain rather stable or actually decline as time proceeds (Figure 15).

We should note that the area of high density described above is just exactly that--highly concentrated. In 1964, Iowa had an average of 376 hogs and pigs sold per rural square mile (Table 6). Twenty-four percent of the United States total production came from Iowa in that year.

The implications for slaughter firms seem clear. Specialization of production points to increasing marketing within the Corn Belt and decreasing marketings outside the Corn Belt. This will likely mean that firms will expand, or new firms will enter, to handle the increased marketings. Those firms located at a distance from the Corn Belt will suffer lower volumes and entry of new firms will be highly unlikely.

Marketing firms should also realize some benefits from the intensity of the production pattern in the heavy hogs marketing region. This should be reflected in lower unit costs of assembly.

Table 5. Hogs and Pigs Sold Alive and Percent of United States Total, Selected States, Selected Years, in Thousands

States	CENSUS YEARS								1964 as a % of 1949
	1949		1954		1959		1964		
	Number Sold	% of US Total	Number Sold	% of US Total	Number Sold	% of US Total	Number Sold	% of US Total	
Illinois	7,285	11	6,853	12	10,588	13	11,761	14	161
Indiana	5,536	8	5,302	9	7,423	9	7,502	9	135
Iowa	14,298	22	14,102	25	18,590	23	19,872	24	139
Kansas	1,648	3	1,051	2	1,710	2	2,258	3	137
Kentucky	1,633	3	973	2	1,775	2	1,770	2	108
Michigan	907	1	811	1	1,067	1	1,167	1	129
Minnesota	4,667	7	4,360	8	5,971	7	5,810	7	125
Missouri	4,541	7	3,642	6	5,851	7	6,181	7	136
Nebraska	3,106	5	2,886	5	3,732	5	4,399	5	142
North Dakota	543	1	398	1	578	1	520	6	96
Ohio	3,801	6	3,213	6	3,881	5	4,175	5	110
South Dakota	2,021	3	1,709	3	2,511	3	2,612	3	129
Wisconsin	2,526	4	2,545	4	3,385	4	3,164	4	125
N C Region	52,512	80	47,845	83	67,062	83	71,191	85	136
West									
California	637	1	501	1	439	.5	302	.4	47
Washington	184	.3	116	.2	180	.2	161	.2	88
Mountain									
Colorado	383	.6	192	.3	290	.4	277	.3	72
Montana	197	.3	110	.2	201	.2	250	.3	127
Arizona	26	.03	19	.03	23	.02	29	.03	111
Wyoming									
South									
Texas	1,203	2	781	1	1,192	2	997	1	83
Oklahoma	886	1	400	.7	582	1	421	.5	48
Georgia	1,124	2	1,113	2	1,700	2	1,677	2	149
Tennessee	1,360	2	911	2	1,541	2	1,479	2	109
U. S. Total	65,512	---	57,419	---	80,901	---	83,537	---	128

Table 6. Density of Hog and Pig Sales, Rank and Percent Change, Selected States, Selected Years

States	CENSUS YEARS								1964 as a % of 1949
	1949 Sales per Rural Sq. Mile	Rank	1954 Sales per Rural Sq. Mile	Rank	1959 Sales per Rural Sq. Mile	Rank	1964 Sales per Rural Sq. Mile	Rank	
N C Region									
Illinois	150.5	3	144.3	3	223.5	3	251.3	3	167
Indiana	180.2	2	176.5	2	255.2	2	267.7	2	149
Iowa	267.1	1	265.1	1	351.7	1	376.8	1	141
Kansas	21.7	14	13.5	14	21.8	14	28.7	14	132
Kentucky	53.8	8	34.5	9	66.7	8	69.7	8	130
Michigan	33.6	11	31.5	11	46.2	12	54.9	12	163
Minnesota	90.8	5	86.4	5	124.1	5	120.7	6	133
Missouri	82.7	6	68.2	7	112.9	6	121.0	5	146
Nebraska	41.9	10	38.9	8	50.0	11	58.9	11	141
North Dakota	8.4	17	6.1	17	8.9	16	8.0	15	95
Ohio	160.0	4	102.9	4	134.2	4	151.6	4	131
South Dakota	28.9	12	24.3	13	35.8	13	36.7	13	127
Wisconsin	69.6	7	72.4	6	102.4	7	99.4	7	143
West									
California	11.1	16	8.5	15	7.6	17	5.2	18	47
Washington	6.8	18	4.2	18	6.2	18	5.4	17	80
Mountain									
Colorado	6.5	19	3.2	20	4.8	20	4.6	19	72
Montana	2.1	21	1.2	21	2.0	21	2.4	21	115
Arizona	.4	22	.3	22	.4	22	.5	22	110
Wyoming									
South									
Texas	5.3	20	3.4	19	5.3	19	4.5	20	85
Oklahoma	15.8	15	7.2	16	10.4	15	7.5	16	47
Georgia	27.9	13	29.7	12	55.4	10	60.0	10	215
Tennessee	47.0	9	33.0	10	61.3	9	62.0	9	132
U. S. Total	36.0	---	31.7	---	46.1	---	48.2	---	134

Changes in Sheep Marketing

Only 10 percent more sheep were marketed in 1964 than in 1949 in the United States (Table 7). Of the entire United States marketings, only 37 percent were made in the North Central Region. Texas is the leader, marketing about 16 percent of the total over the 15-year period. Table 7 should be interpreted with caution, since some double counting may be expected. No doubt the same phenomenon is observable in the case of sheep and lambs as was seen in the case of hogs and pigs. Some specialization is occurring in the raising of feeder lambs and the fattening of these lambs in the Corn Belt. This partially explains the density of sales of sheep and lambs in Iowa, for instance (Table 8).

Three general comments may be made upon inspection of the contour maps (Figures 16 - 20). First of all, it is obvious that not any area even approaches any real degree of concentration. Only a few small areas sell over 51 animals per rural square mile. By comparison, Iowa sold 376 hogs and pigs per rural square mile in 1964. A second comment is that it appears that the highest intensity of sales occurs in the same areas where cattle feeding is likewise concentrated. This lends support to the assumption that most of the sales in the North Central Region is the resale of fat lambs for slaughter. Finally, data in Figure 20 show that extensive areas of the Region are experiencing declining sheep sales. Only relatively small areas exhibit increasing concentration and most of these start from a low base.

Table 7. Sheep and Lambs Sold Alive and Percent of United States Total, Selected States, Selected Years, in Thousands

States	CENSUS YEARS								1964 as a % of 1949
	1949		1954		1959		1964		
	Number Sold	% of US Total	Number Sold	% of US Total	Number Sold	% of US Total	Number Sold	% of US Total	
Illinois	465	2	597	3	646	3	607	3	131
Indiana	400	2	409	2	427	2	303	1	76
Iowa	873	4	1,384	6	1,484	6	1,556	7	178
Kansas	550	3	476	2	670	3	564	3	103
Kentucky	557	3	482	2	515	2	183	1	33
Michigan	247	1	268	1	287	1	243	1	99
Minnesota	579	3	622	3	781	3	726	3	125
Missouri	825	4	624	3	680	3	396	2	48
Nebraska	592	3	844	4	813	3	663	3	112
North Dakota	239	2	393	2	548	2	460	2	140
Ohio	679	3	765	3	857	3	681	3	100
South Dakota	789	4	901	4	1,688	7	1,596	7	202
Wisconsin	174	1	194	1	177	.7	151	.7	86
NC Region	6,969	35	7,959	36	9,573	38	8,129	37	115
West									
California	1,278	6	1,496	7	1,754	7	1,613	7	126
Washington	242	1	236	1	308	1	212	1	88
Mountain									
Colorado	1,533	8	1,622	7	1,778	7	1,610	7	105
Montana	1,220	6	1,267	6	1,324	5	1,176	5	96
Arizona	150	1	197	1	229	1	341	2	228
Wyoming	1,148	6	1,448	6	1,778	7	1,403	6	122
South									
Texas	3,282	16	3,293	15	3,293	13	3,452	16	105
Oklahoma	98	.4	156	.7	215	1	115	.5	117
Georgia	4	.01	---	NA	20	.07	5	.02	134
Tennessee	195	1	197	1	202	1	84	.4	43
U. S. Total	20,003	---	22,336	---	25,394	---	22,082	---	110

Table 8. Density of Sheep and Lamb Sales, Rank and Percent Change, Selected States, Selected Years

States	CENSUS YEARS 1949 Sales per Rural Sq. Mile	Rank	1954 Sales per Rural Sq. Mile	Rank	1959 Sales per Rural Sq. Mile	Rank	1964 Sales per Rural Sq. Mile	Rank	1964 as a % of 1949
N C. Region									
Illinois	9.6	13	12.6	11	13.6	11	13.0	9	135
Indiana	13.0	10	13.6	8	14.7	10	10.1	12	78
Iowa	16.3	6	26.0	3	28.1	5	29.5	1	181
Kansas	7.2	17	6.1	18	8.6	17	7.2	16	100
Kentucky	18.3	5	17.1	6	19.4	7	7.2	15	39
Michigan	9.1	14	10.4	15	12.4	14	11.4	11	125
Minnesota	11.3	12	12.3	12	16.2	8	15.1	8	134
Missouri	15.0	7	11.7	13	13.1	13	7.7	14	51
Nebraska	8.0	16	11.4	14	10.9	15	8.9	13	111
North Dakota	5.1	19	6.0	19	8.5	18	7.1	18	139
Ohio	20.7	4	24.5	5	29.6	4	24.8	4	120
South Dakota	11.3	11	12.8	10	24.1	6	22.4	6	198
Wisconsin	4.8	20	5.5	20	5.4	20	4.7	20	98
West									
California	22.4	2	25.3	4	30.4	2	27.9	2	125
Washington	8.9	15	8.6	16	10.5	16	7.1	17	80
Mountain									
Colorado	25.9	1	27.1	1	29.3	3	26.9	3	104
Montana	13.2	9	13.2	9	13.2	12	11.4	10	87
Arizona	2.4	21	3.0	21	3.7	22	5.4	19	224
Wyoming	21.3	3	26.5	2	31.4	1	24.2	5	114
South									
Texas	14.5	8	14.5	7	14.7	9	15.6	7	108
Oklahoma	1.8	22	2.8	22	3.8	21	2.0	22	117
Georgia	.1	23	NA	NA	.7	23	.2	23	200
Tennessee	6.7	18	7.1	17	8.0	19	3.5	21	52
U. S. Total	11.0	---	12.3	---	14.5	---	12.7	---	115

The broad geographic changes in livestock production as reflected by marketings of live animals have been summarized for the North Central Region, but contour maps also permit the observation of changes over small geographic areas as well. Therefore, contour maps drawn from county data are included in this paper for the express purpose of pinpointing changes that are of interest to specific marketing agencies, in order that they may trace changes in production in their own individual trade territories.

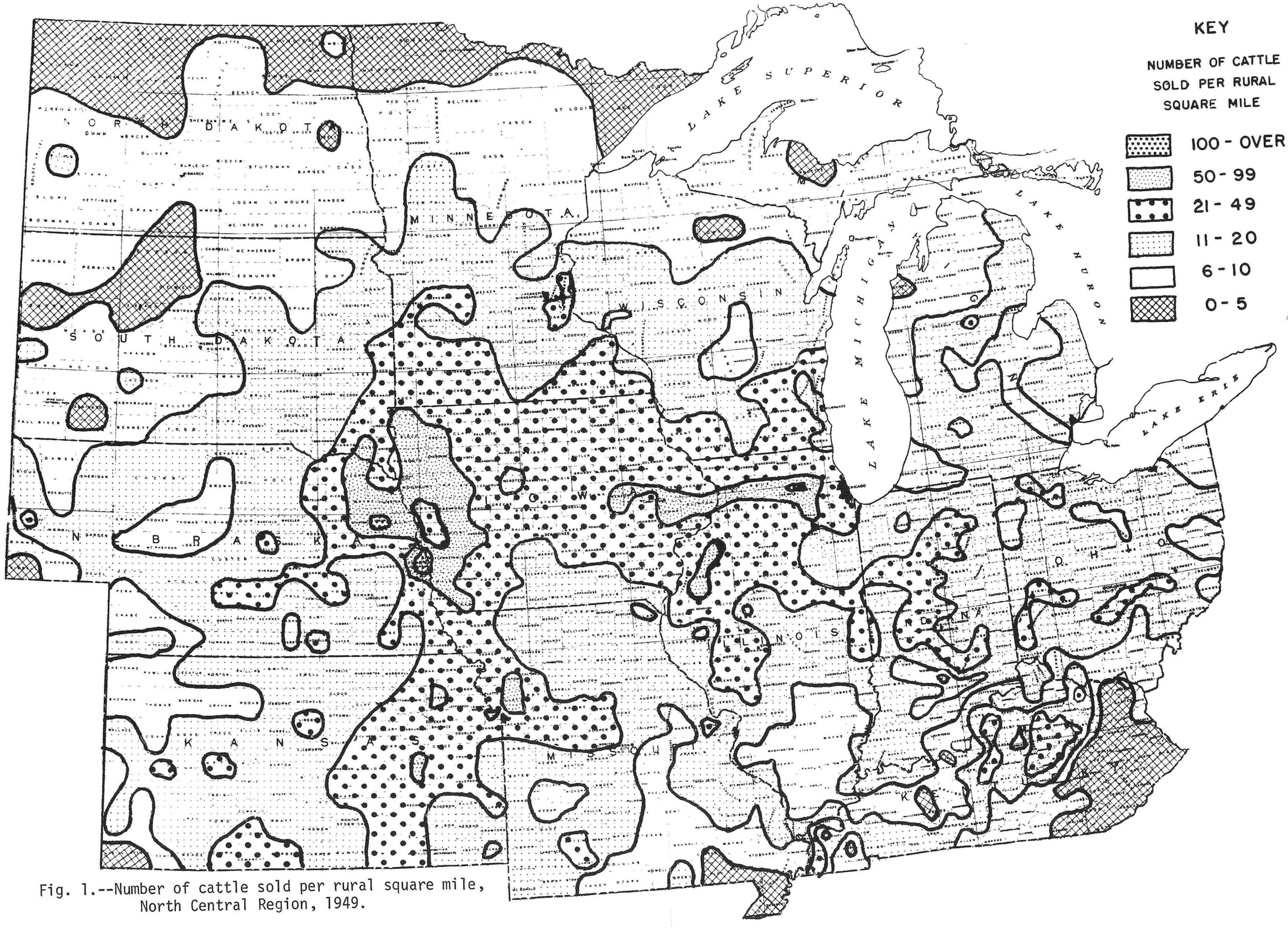

Fig. 1.--Number of cattle sold per rural square mile, North Central Region, 1949.

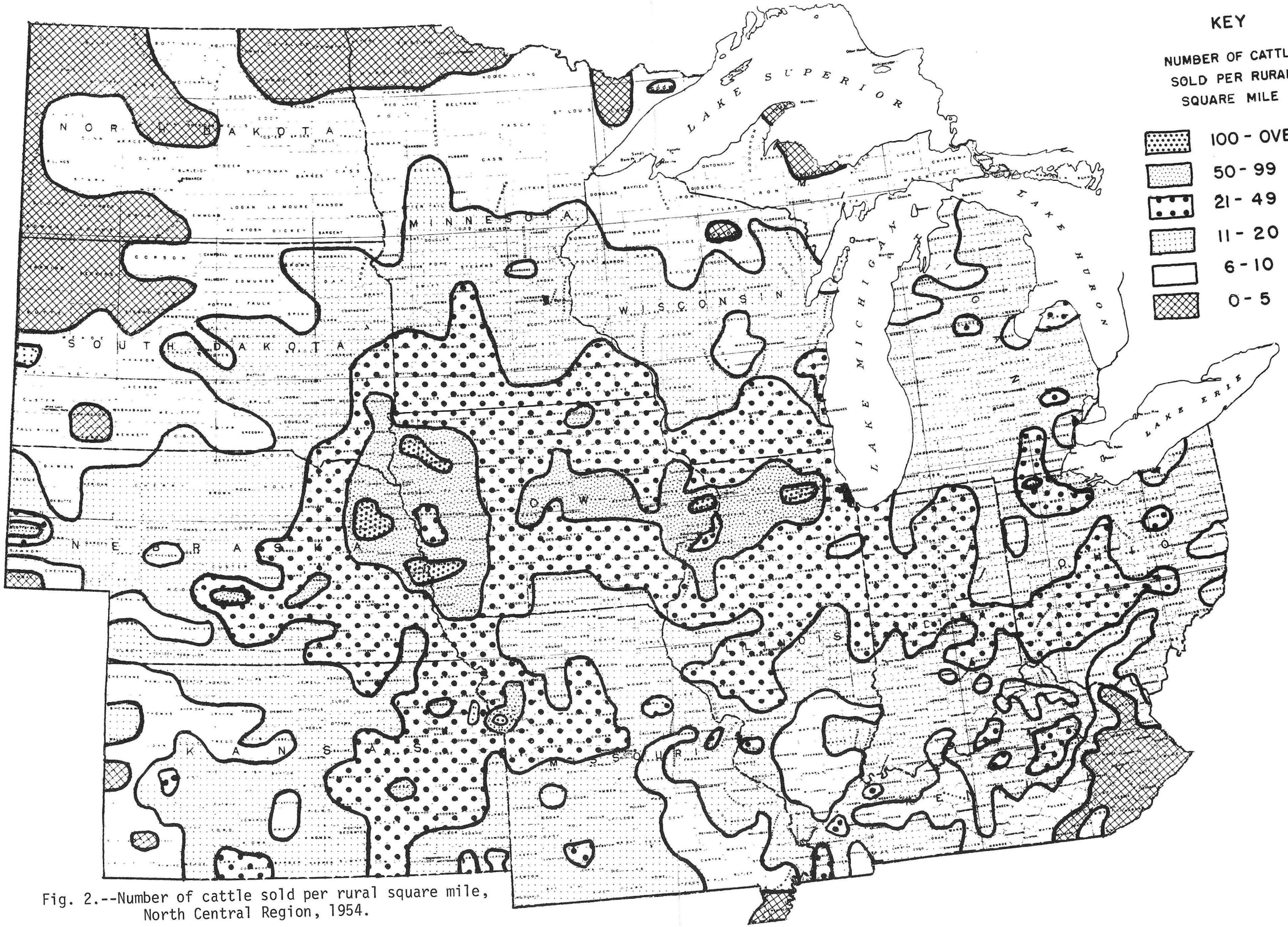

Fig. 2.--Number of cattle sold per rural square mile, North Central Region, 1954.

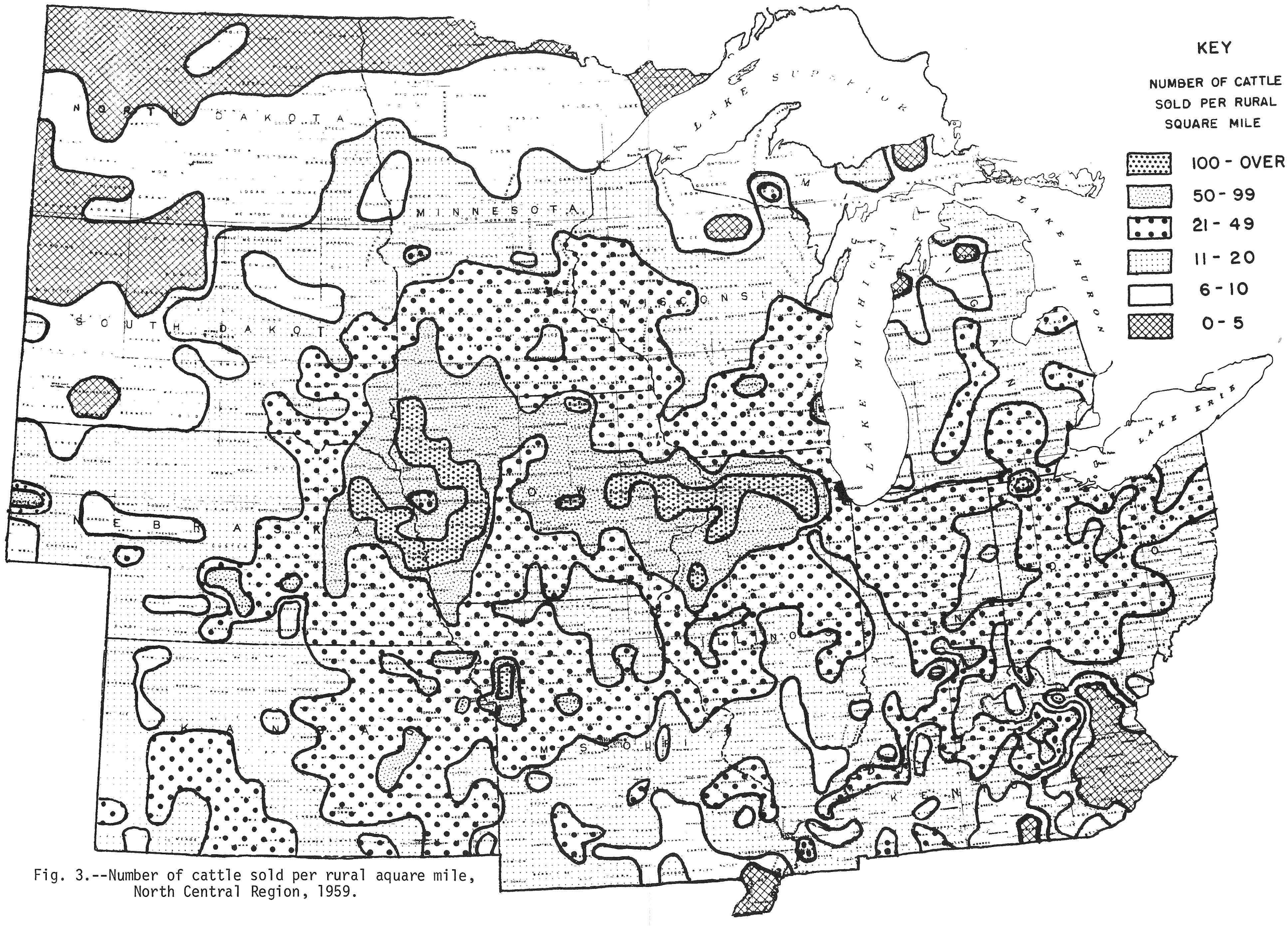

Fig. 3.--Number of cattle sold per rural aquare mile, North Central Region, 1959.

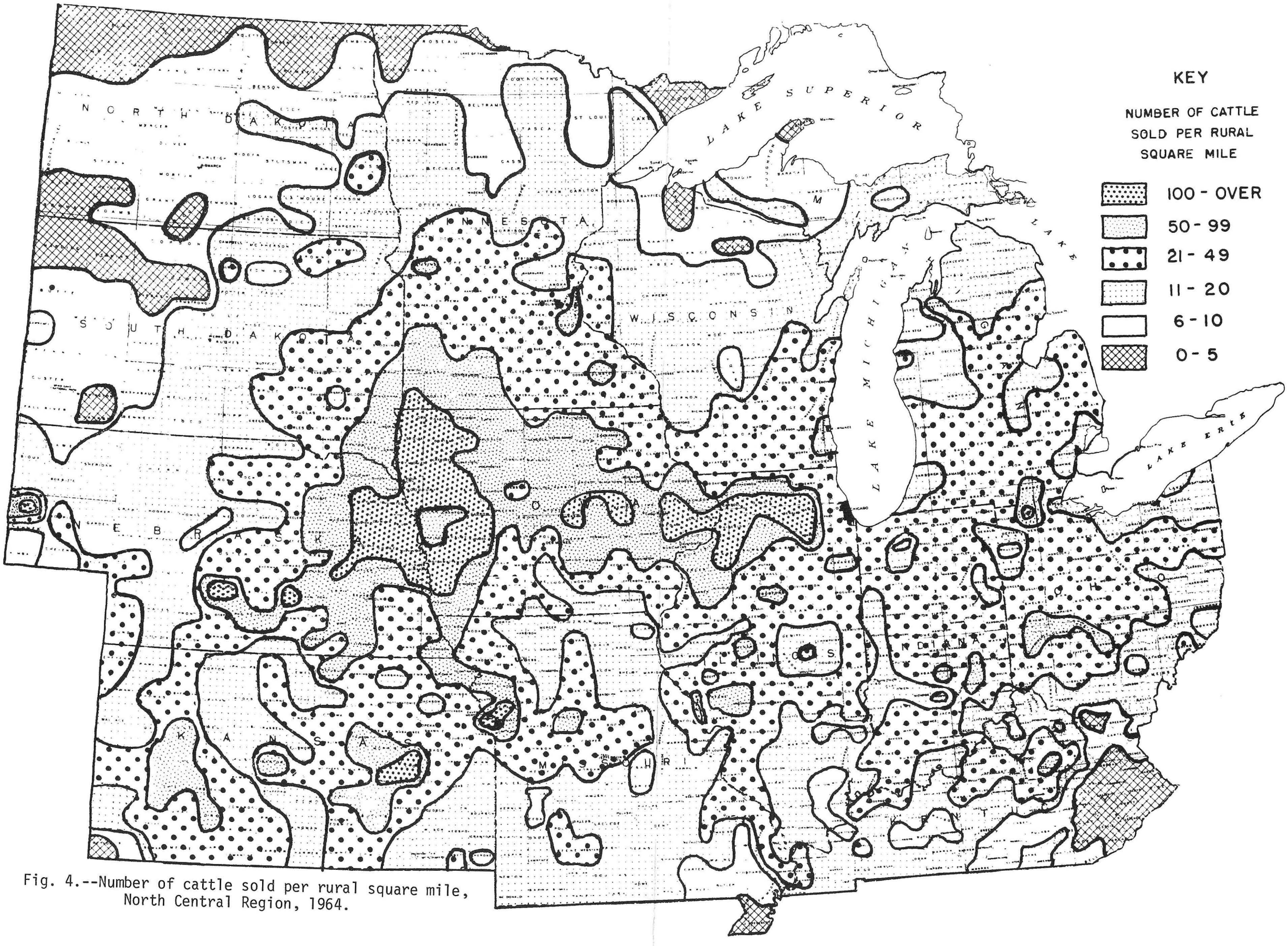

Fig. 4.--Number of cattle sold per rural square mile, North Central Region, 1964.

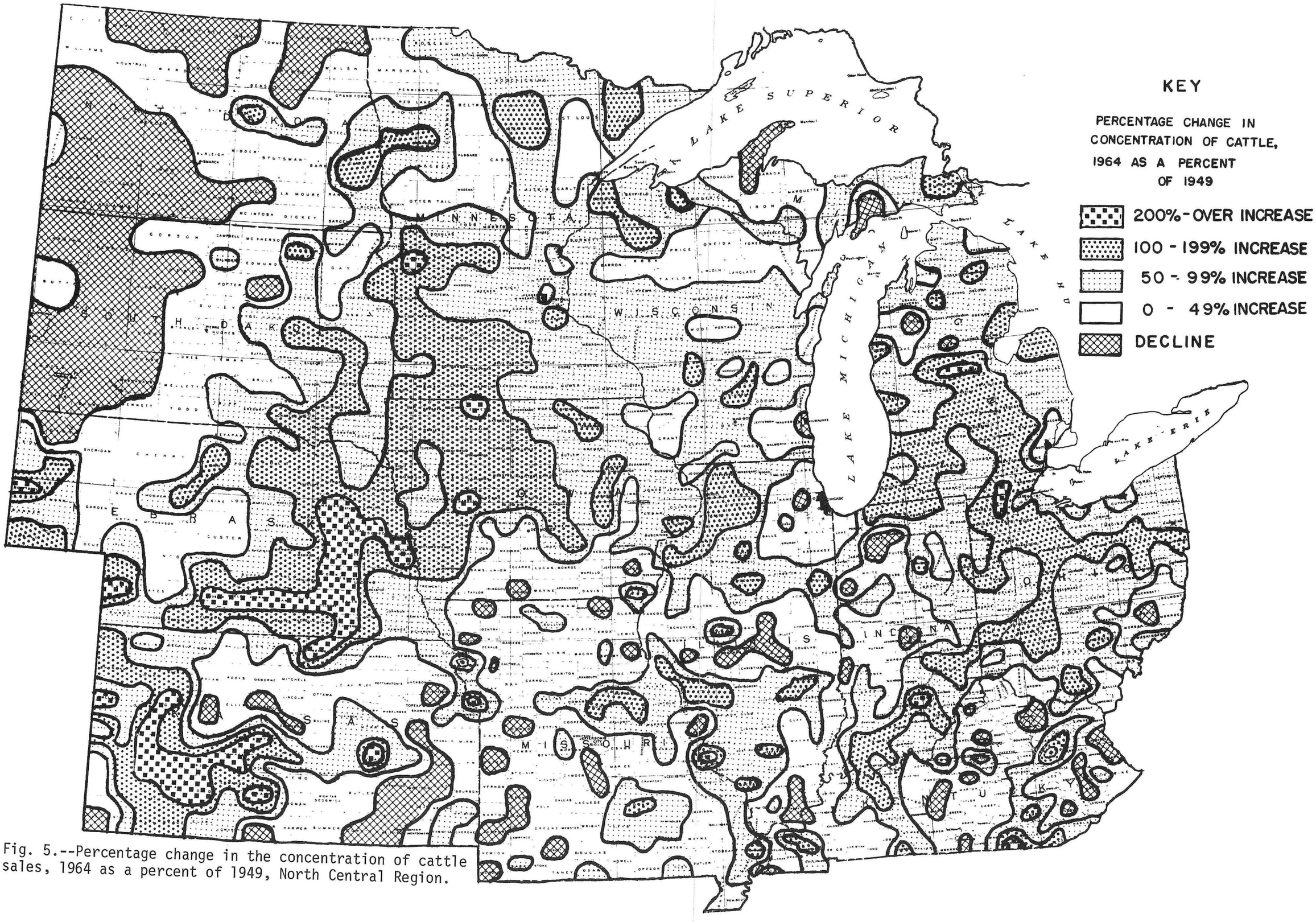

Fig. 5.--Percentage change in the concentration of cattle sales, 1964 as a percent of 1949, North Central Region.

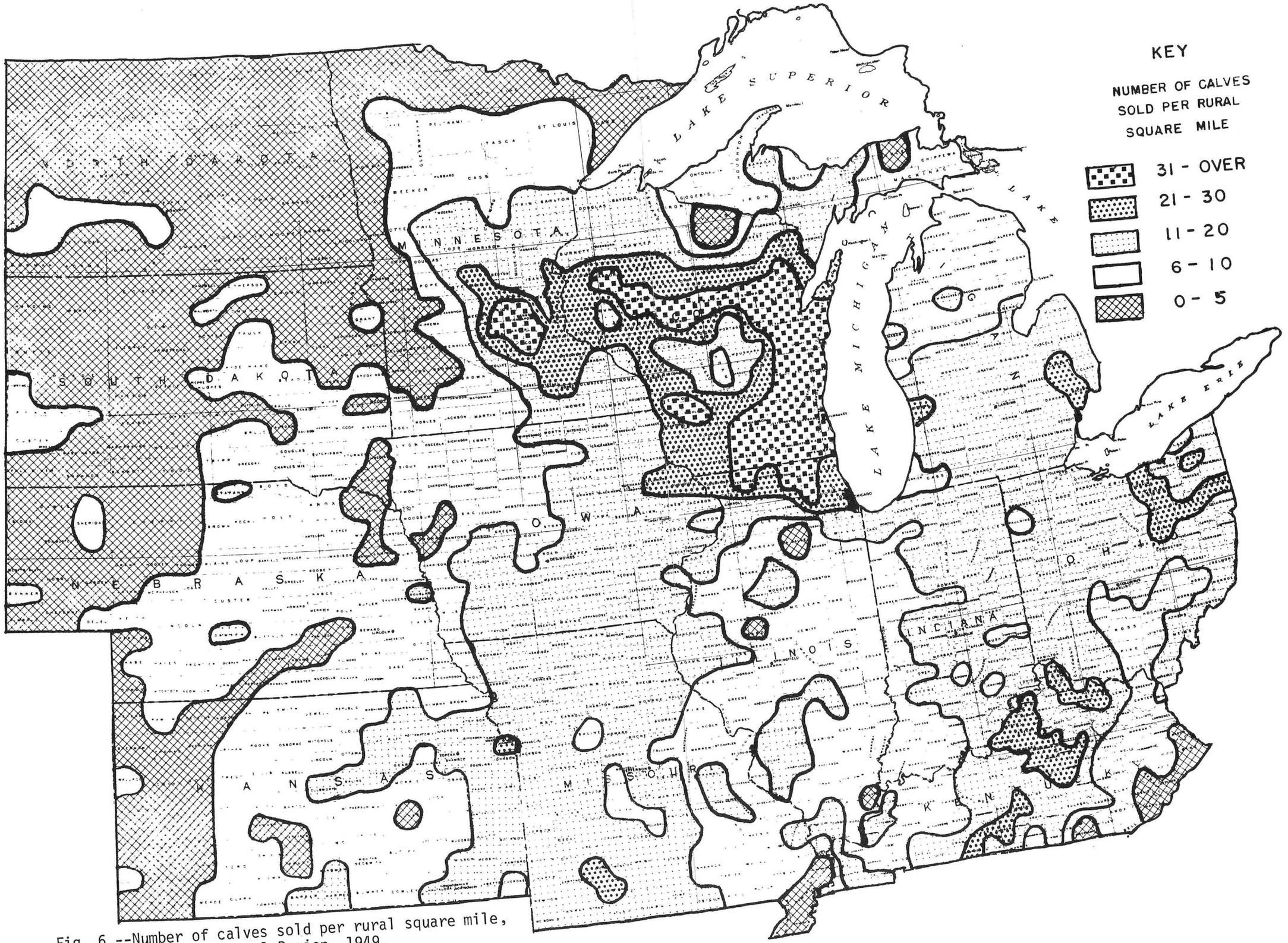

Fig. 6.--Number of calves sold per rural square mile, North Central Region, 1949.

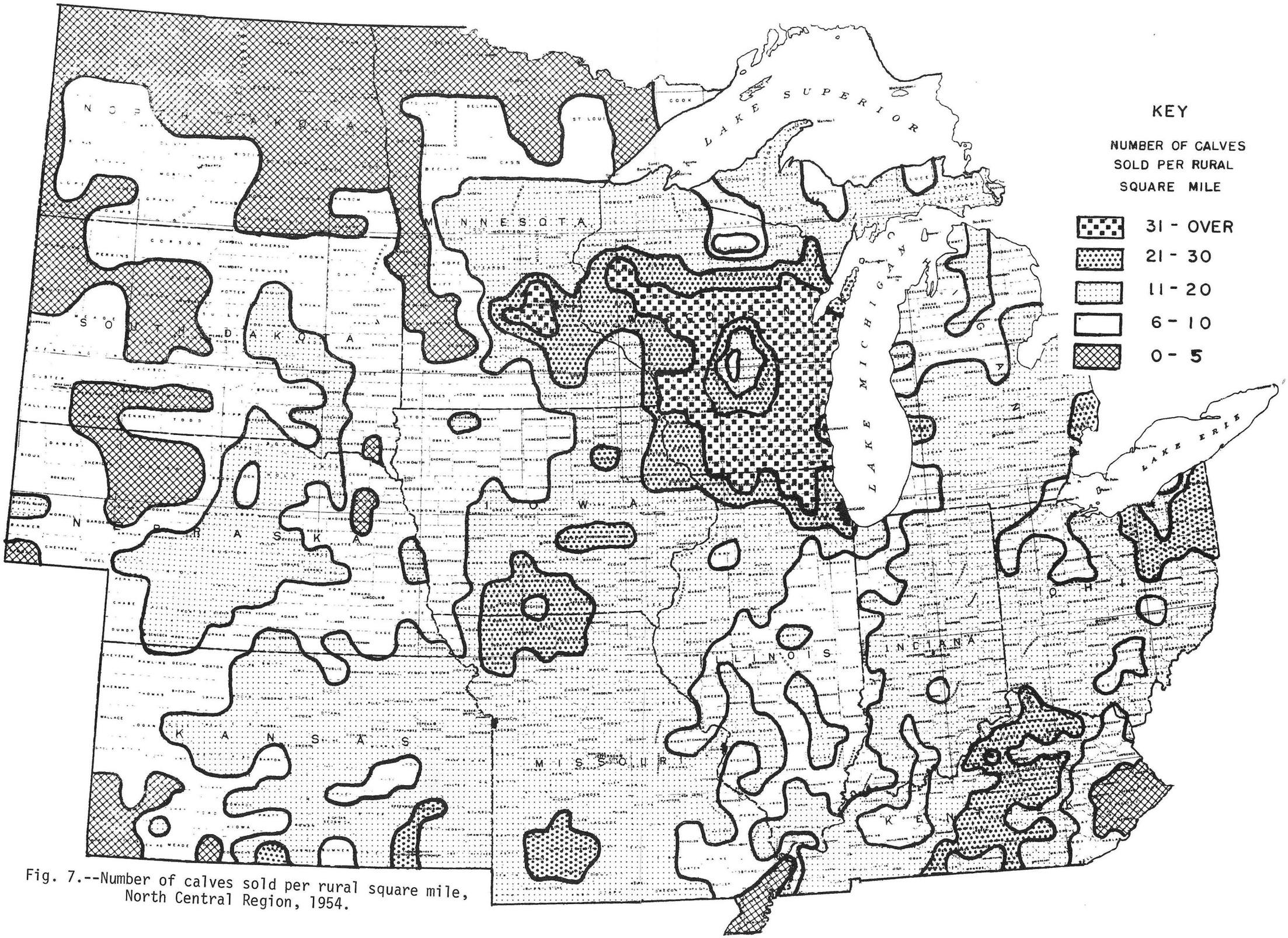

Fig. 7.--Number of calves sold per rural square mile, North Central Region, 1954.

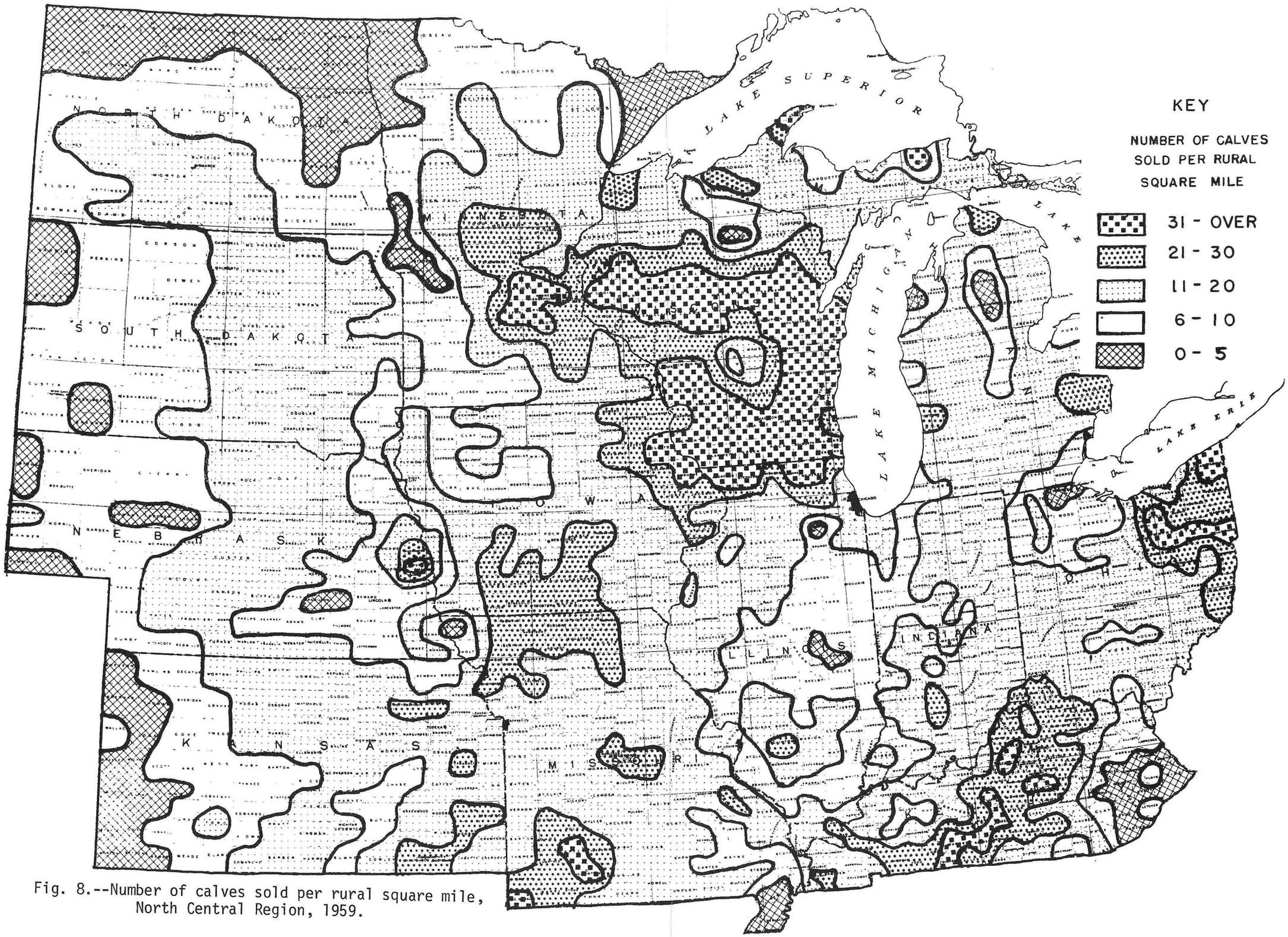

Fig. 8.--Number of calves sold per rural square mile, North Central Region, 1959.

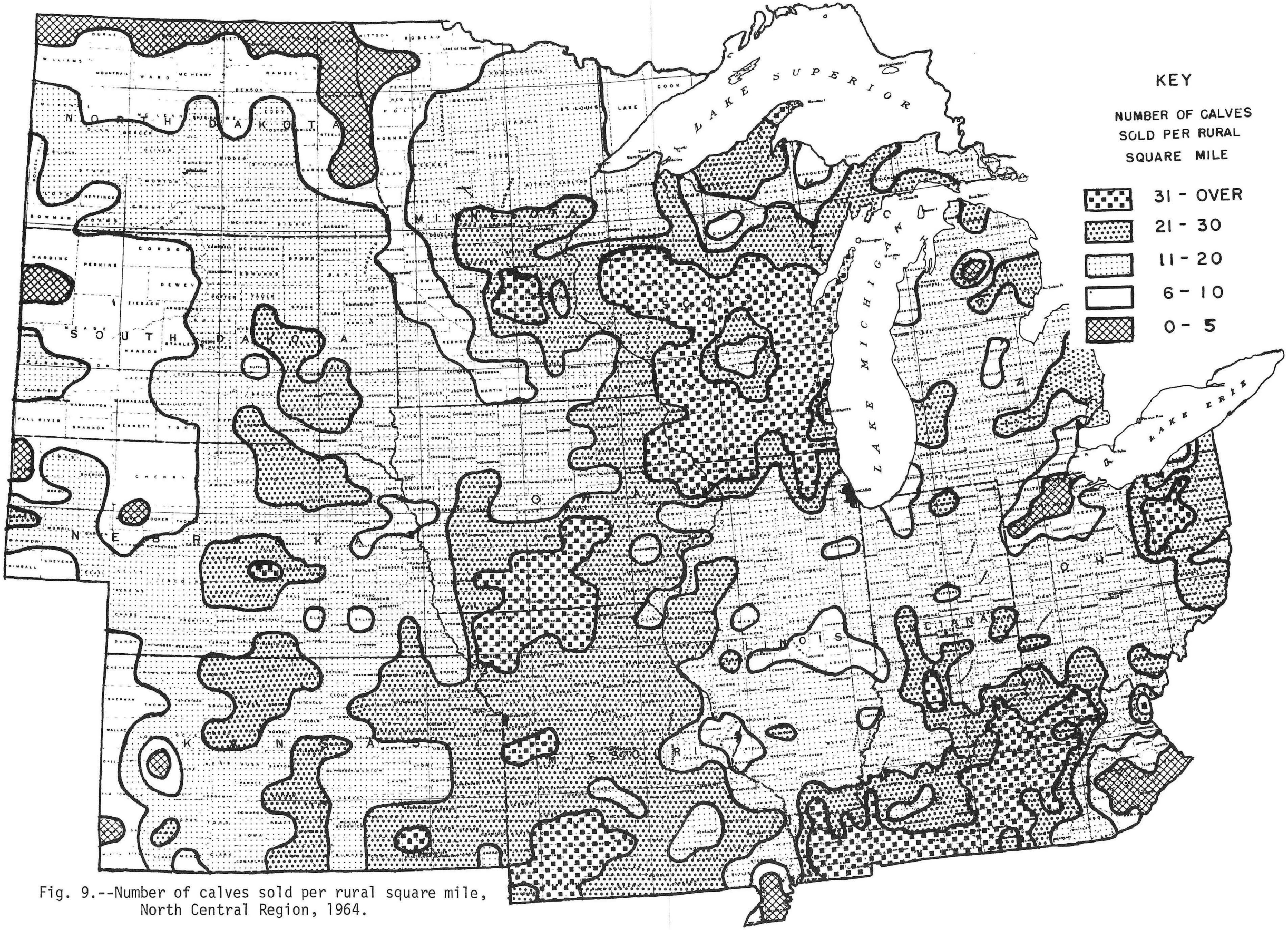

Fig. 9.--Number of calves sold per rural square mile, North Central Region, 1964.

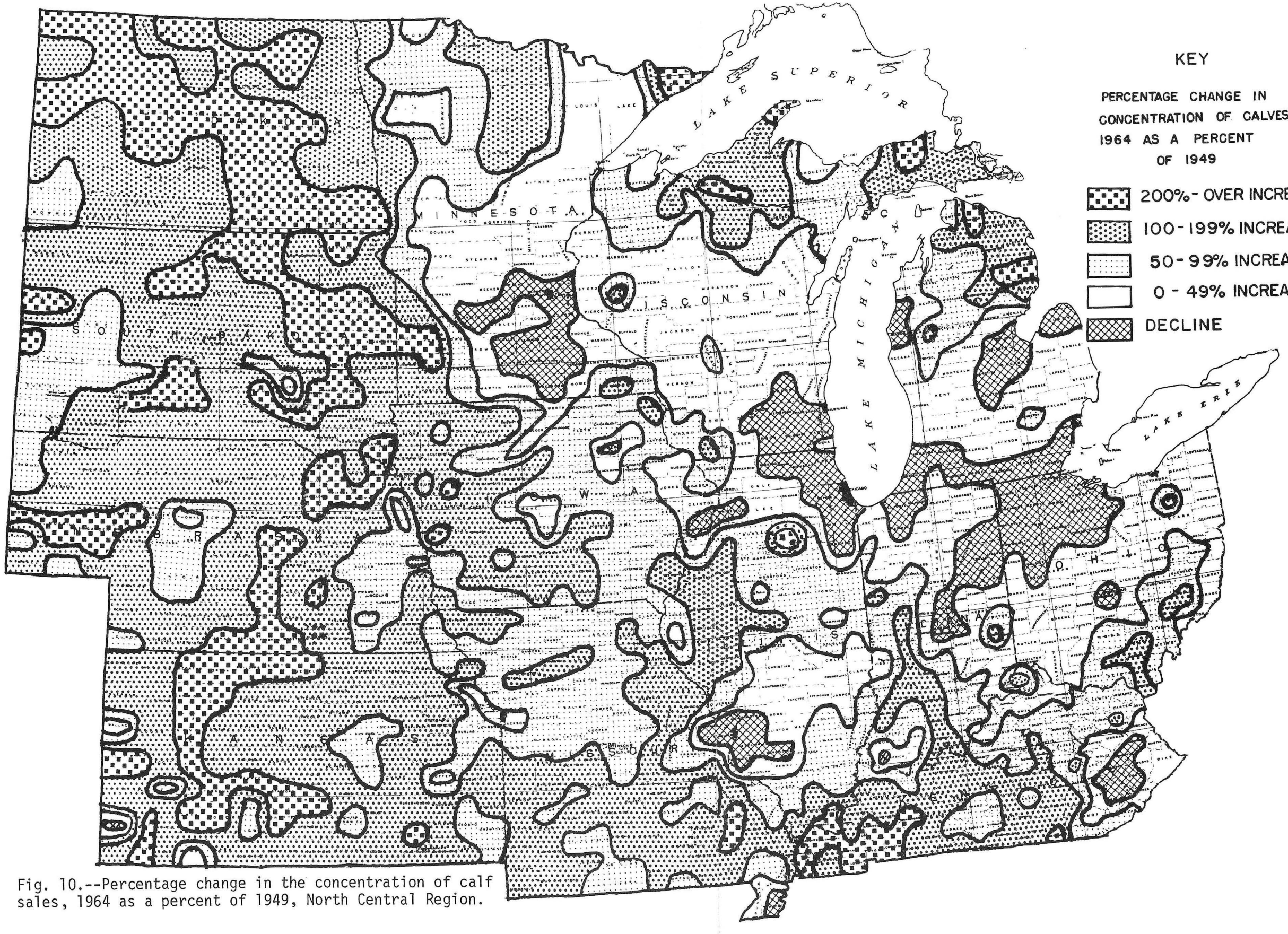

Fig. 10.--Percentage change in the concentration of calf sales, 1964 as a percent of 1949, North Central Region.

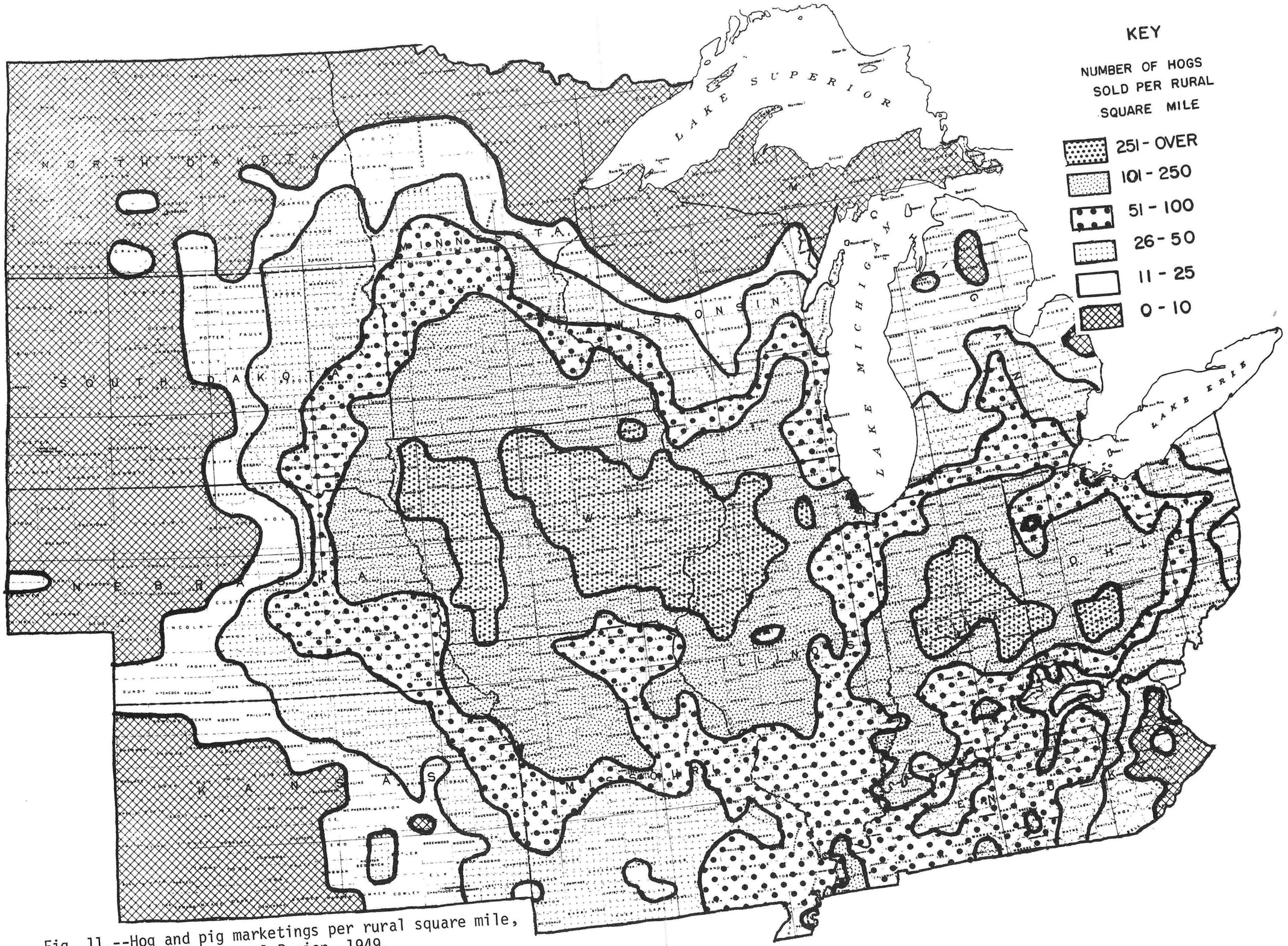

Fig. 11.--Hog and pig marketings per rural square mile, North Central Region, 1949.

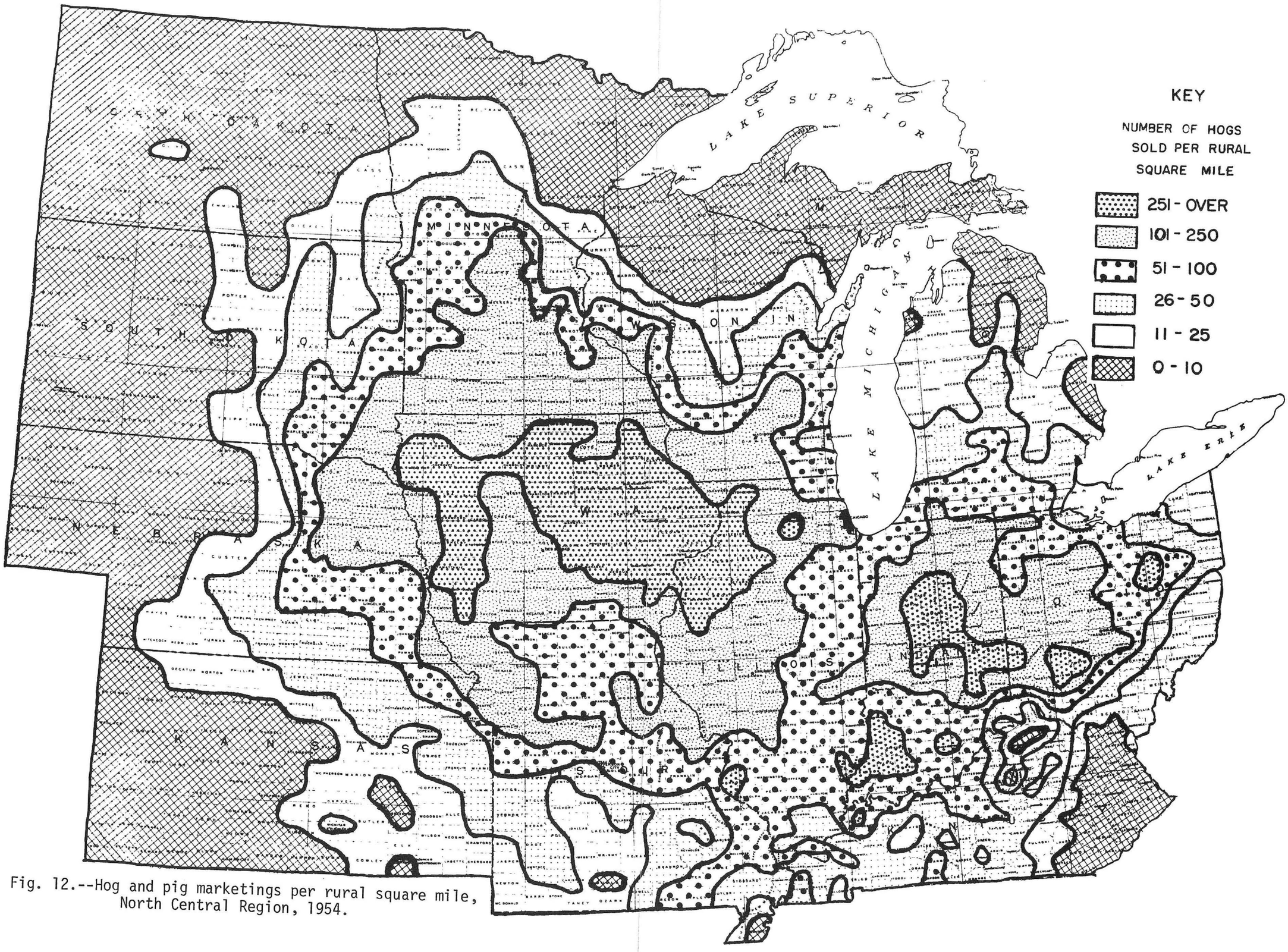

Fig. 12.--Hog and pig marketings per rural square mile, North Central Region, 1954.

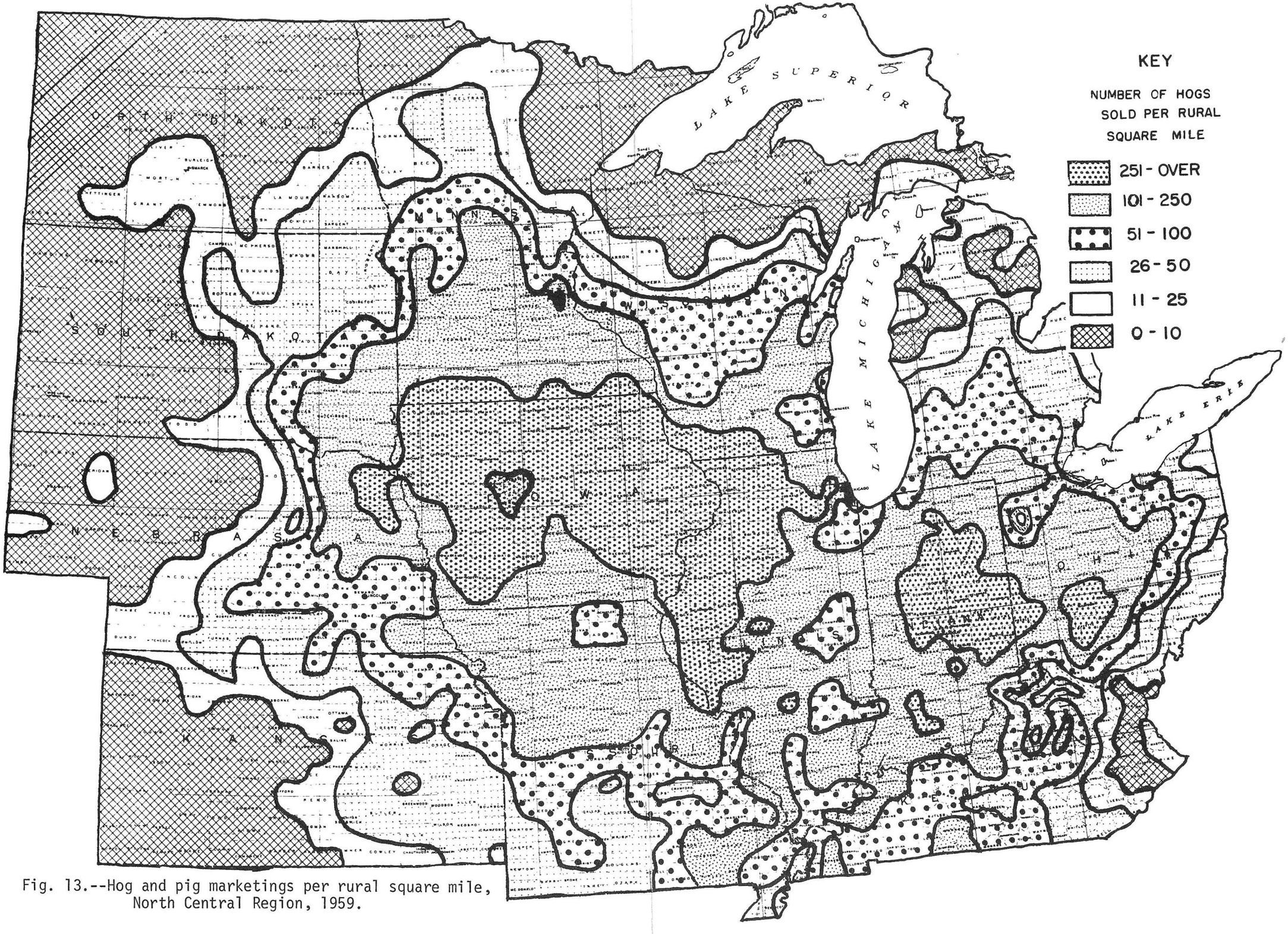

Fig. 13.--Hog and pig marketings per rural square mile, North Central Region, 1959.

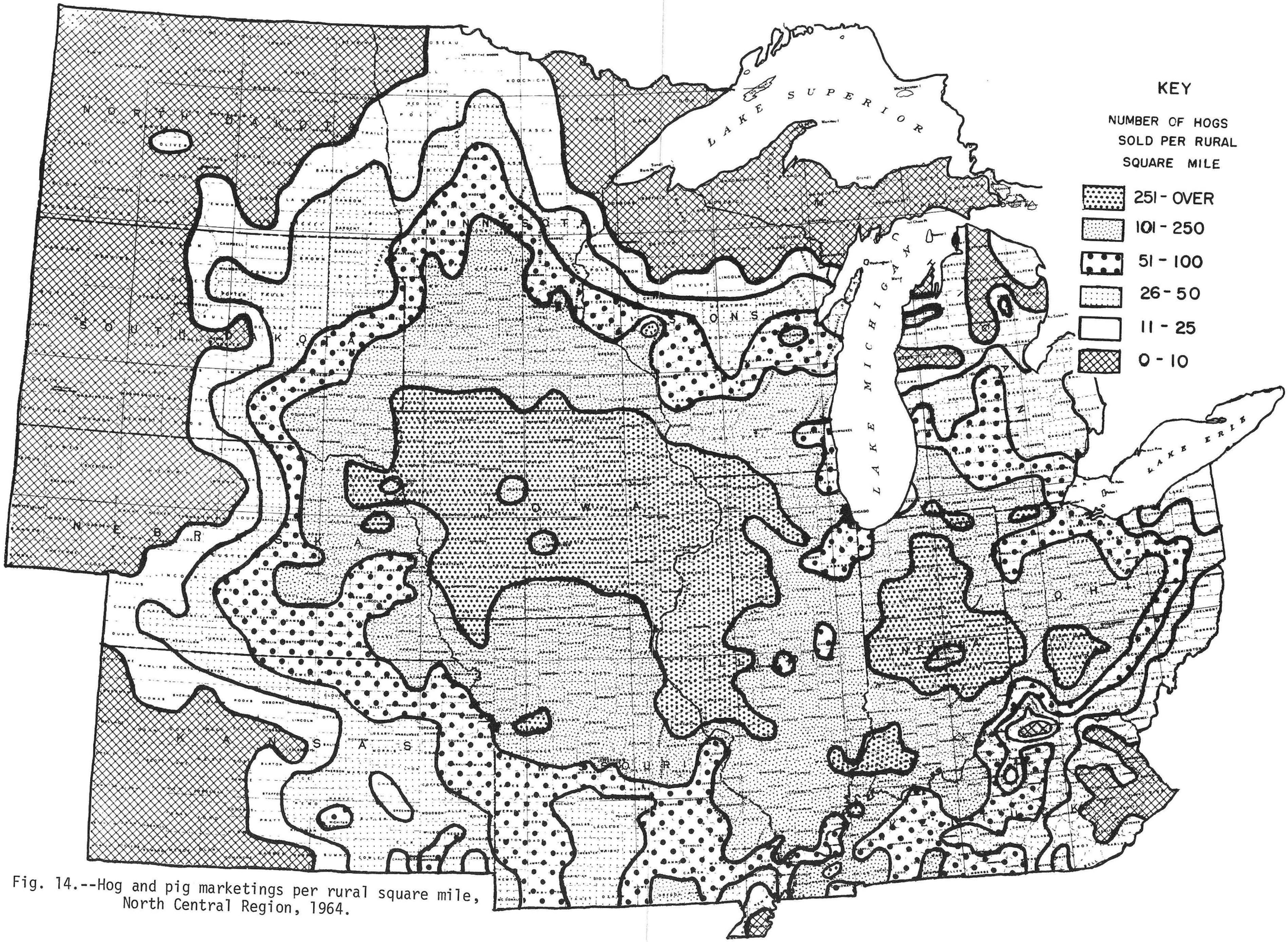

Fig. 14.--Hog and pig marketings per rural square mile, North Central Region, 1964.

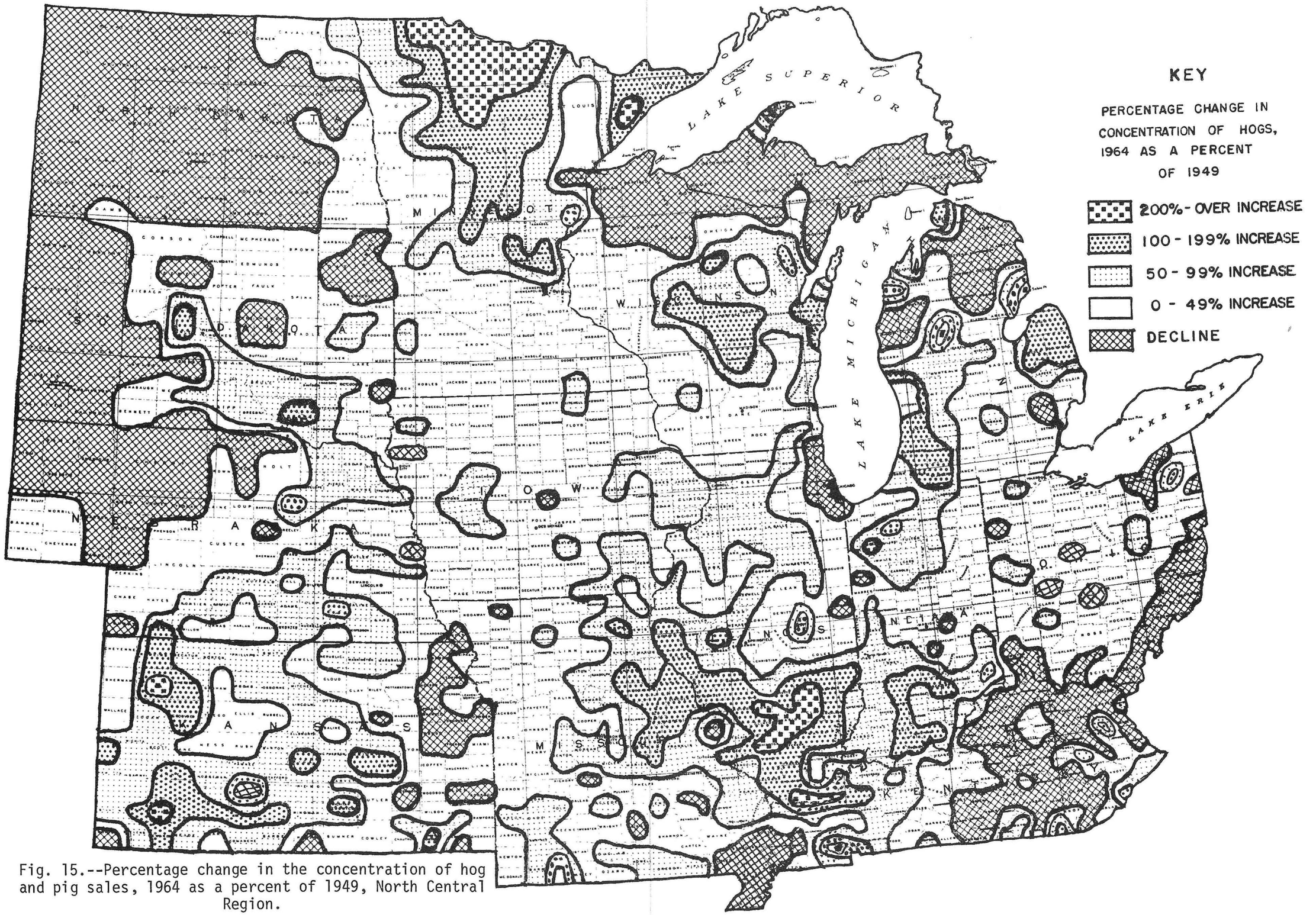

Fig. 15.--Percentage change in the concentration of hog and pig sales, 1964 as a percent of 1949, North Central Region.

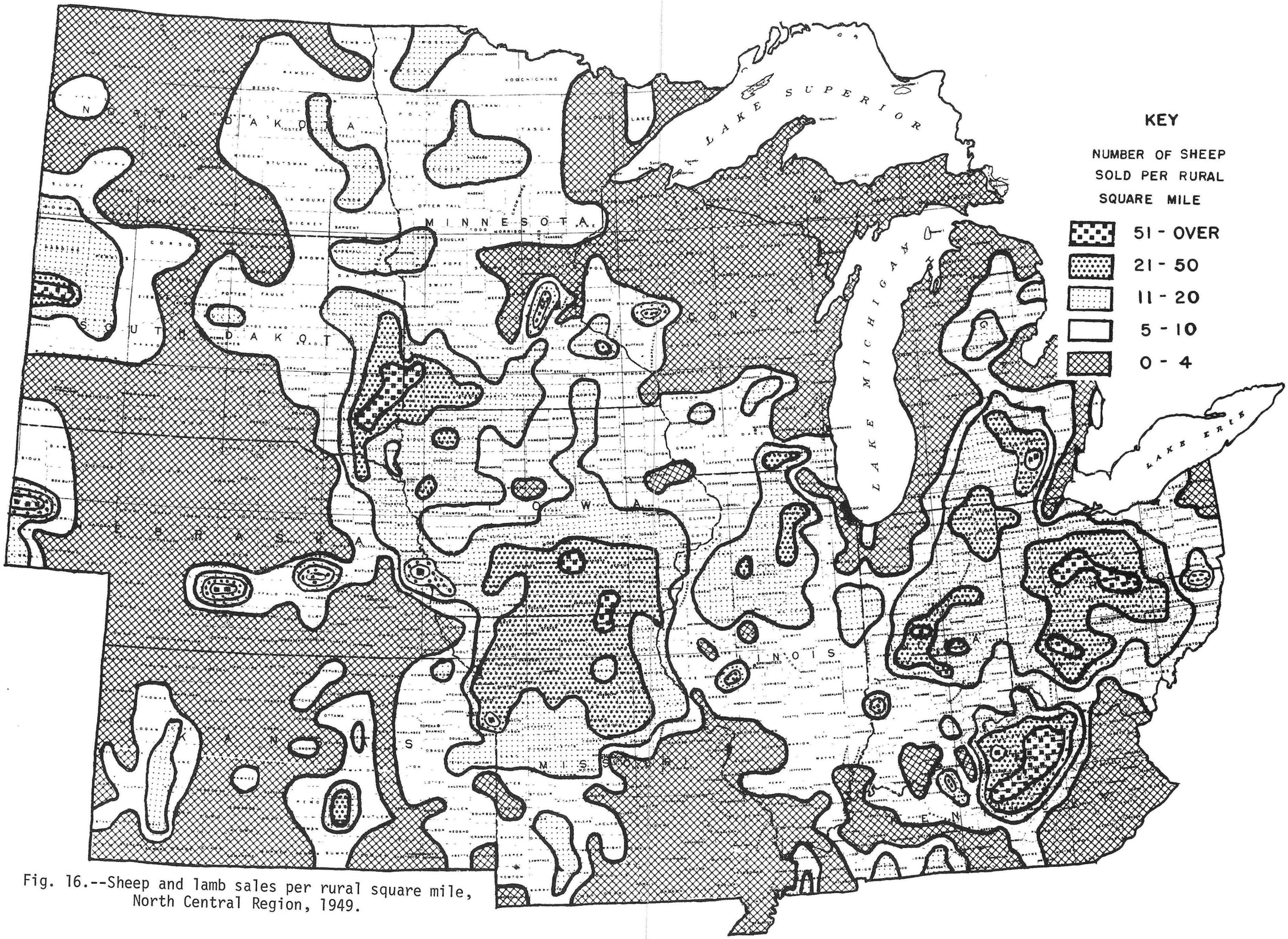

Fig. 16.--Sheep and lamb sales per rural square mile, North Central Region, 1949.

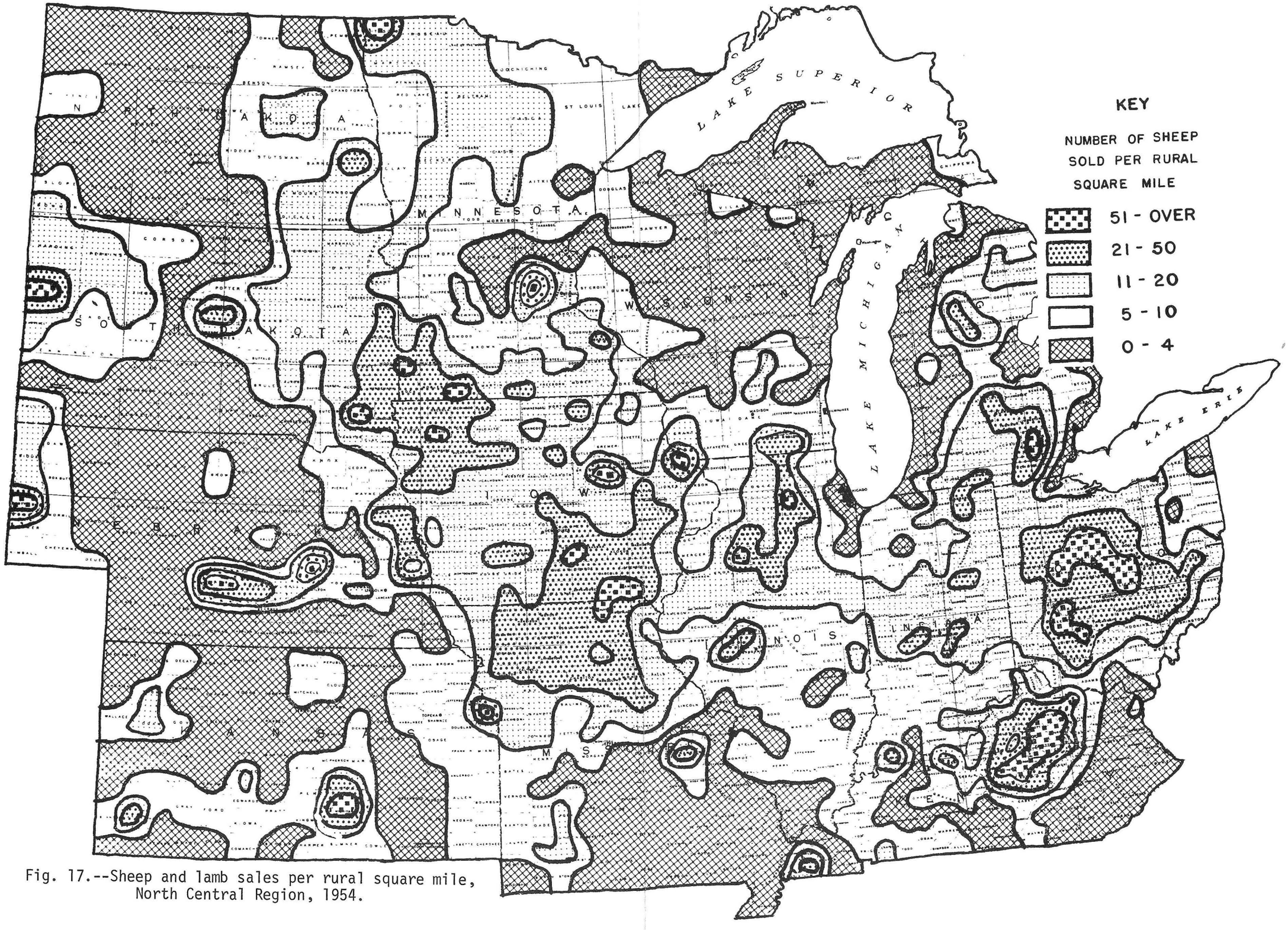

Fig. 17.--Sheep and lamb sales per rural square mile, North Central Region, 1954.

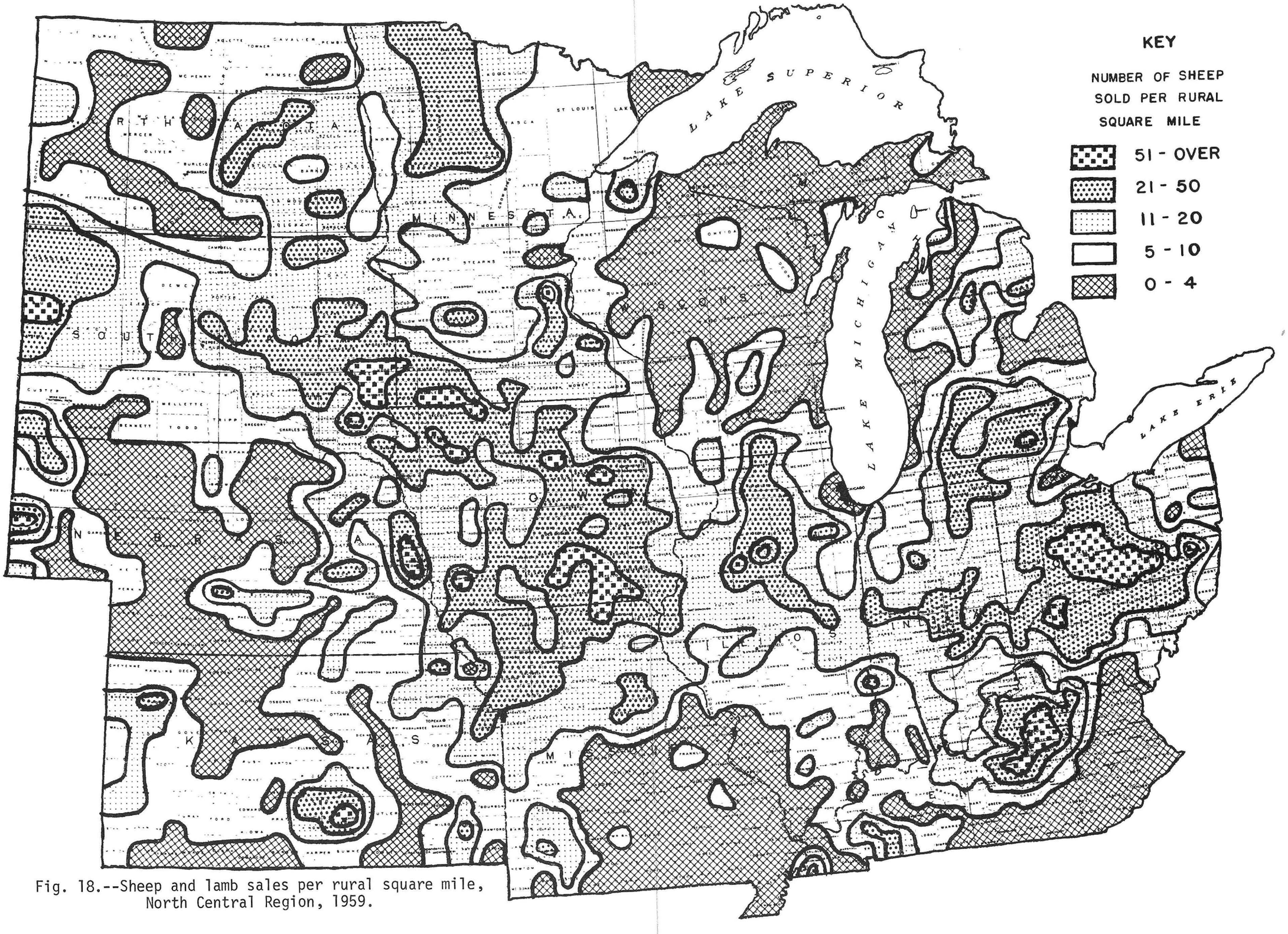

Fig. 18.--Sheep and lamb sales per rural square mile, North Central Region, 1959.

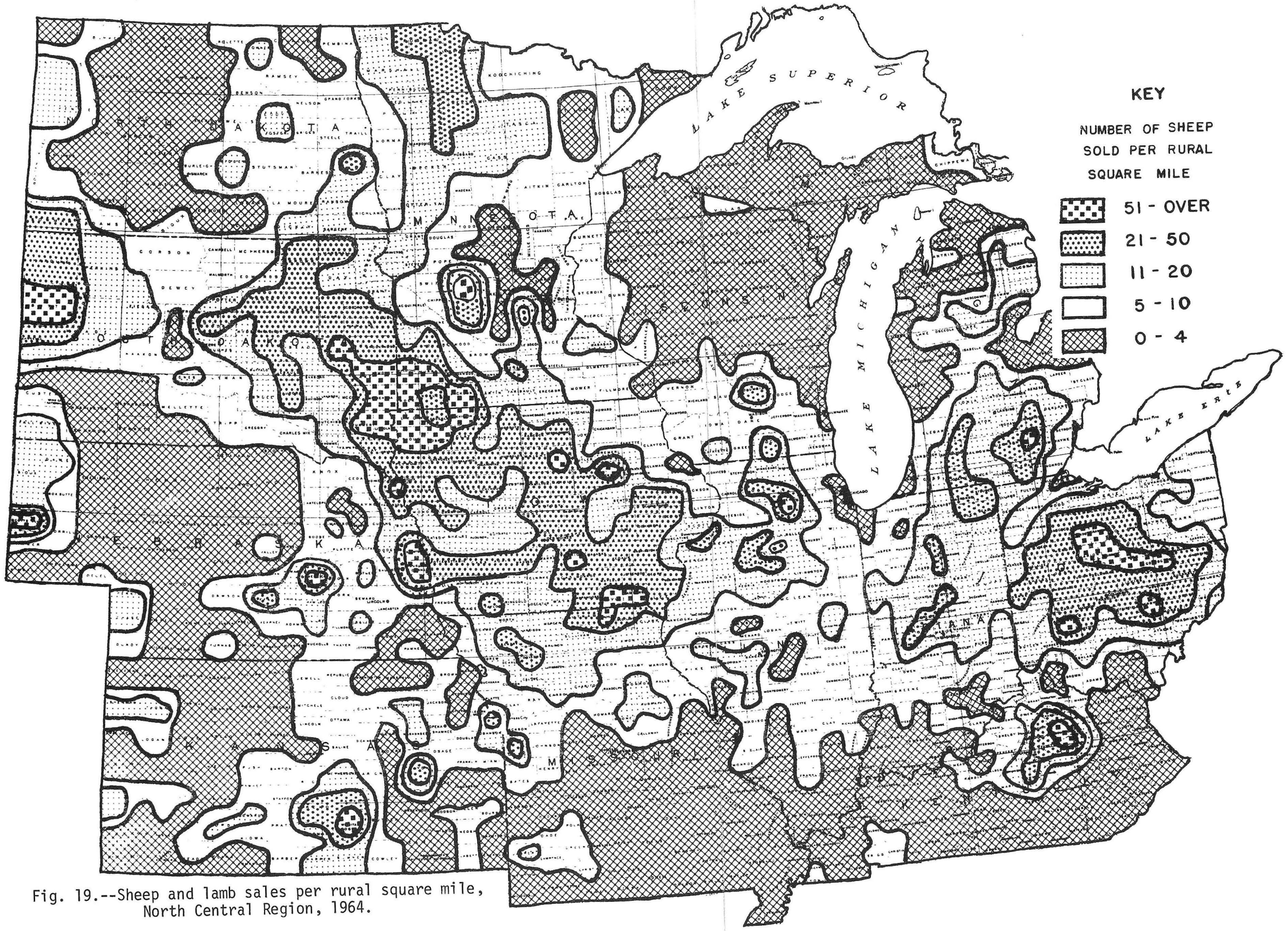

Fig. 19.--Sheep and lamb sales per rural square mile, North Central Region, 1964.

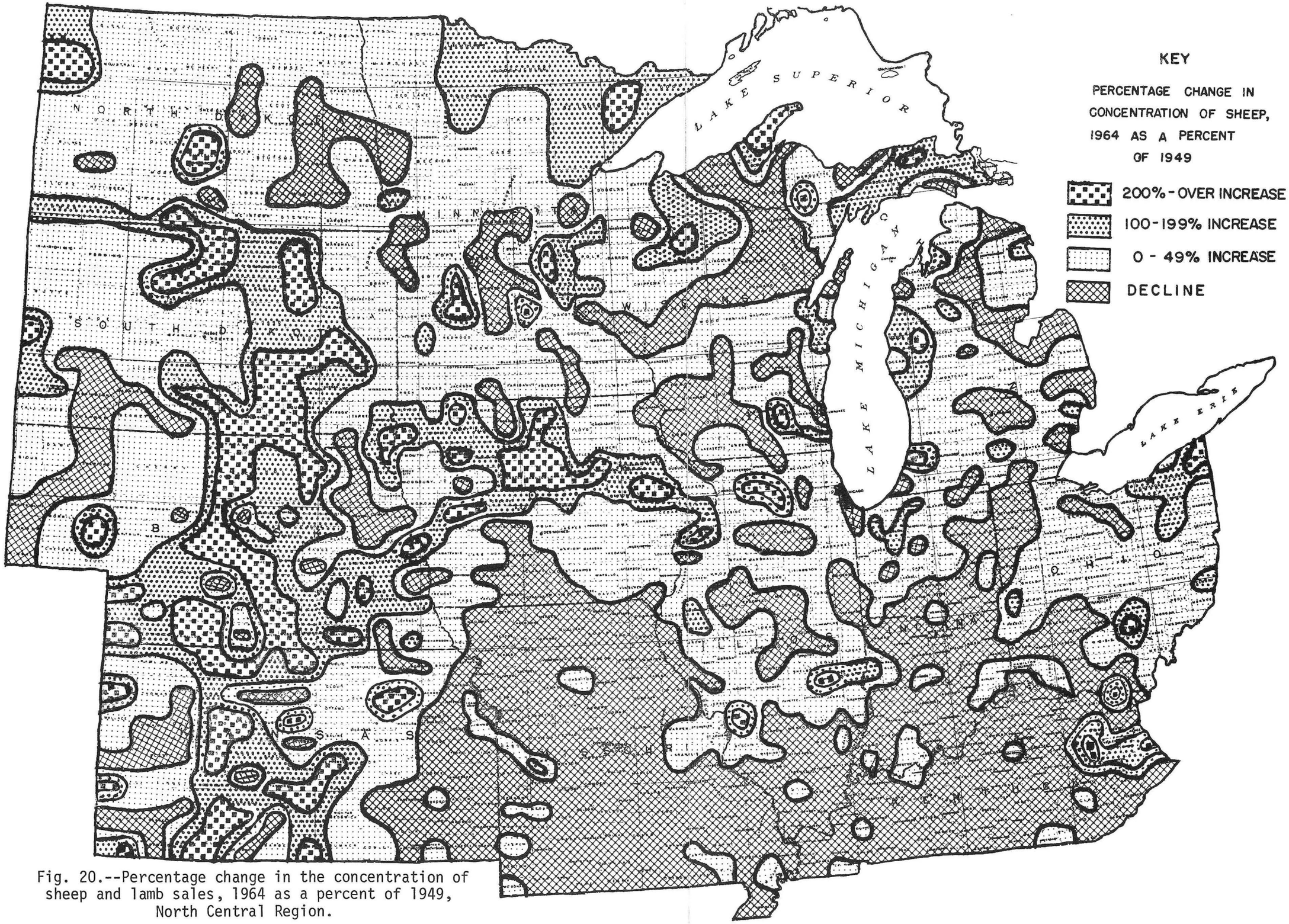

Fig. 20.--Percentage change in the concentration of sheep and lamb sales, 1964 as a percent of 1949, North Central Region.

Market Organization Alternatives

The papers by Mark Powers, Marvin Skadberg, and James Kendrick are interrelated. As part of the NCM-36 North Central Regional Livestock Marketing research effort, the representatives of South Dakota, Iowa, and Nebraska developed a sub-project, "Livestock Marketing in the Upper Missouri River Basin." The findings of this three-state study have direct application only to the Sioux City complex. However, Skadberg, Powers, and Kendrick feel that their findings have general implications for the North Central Region.

IMPACT OF CHANGING MARKETING PATTERNS ON BEEF PACKING PLANTS

James G. Kendrick
University of Nebraska

One of the objectives of the South Dakota, Iowa, and Nebraska study of the livestock marketing system that is centered at Sioux City, Iowa was to make a determination of the cost structure and optimal strategies of the in-plant operations stage for beef slaughters. The goal is to develop long-run average costs which are comprised of short-run average cost curves. For the purposes of this study, two types of short-run costs were developed.

This report is concerned only with the broad findings of a detailed study of beef packing plant costs. The detailed tables and charts that support these conclusions will be included in a forthcoming regional publication.

Time and Rate Adjustments

Once a plant has been built and equipped, it has made a long-run adjustment, and only in the long-run can the plant change this commitment. The equipment share of the combination is committed so in the short-run, the real flexibility rests on labor. Normally, we think of one short-run curve which exemplifies the short-run adjustments; but in this study, we wanted to look at two types of short-run adjustments. These two adjustments were defined as the short and medium run.

Short-Run

The short-run adjustment is a time change. Here, a fixed combination of labor and equipment is utilized for different lengths of time. If demand is weak or supplies non-existant, a plant may work its combination of men and equipment seven hours per day or work only four eight-hour days per week. How the time is allotted is not the important idea, but rather that in the short-run, a plant can vary the amount of time that a certain combination of factors is utilized. The time adjustment has been designated the short-run because this adjustment can be made on a day-by-day basis. Union contracts, as well as non-union work agreements, usually guarantee a worker a week's

work once he is called to work. Some agreements guarantee forty-hour work weeks for all fifty-two weeks of the year while some contracts call for a forty-hour week forty weeks of each year and a thirty-six hour week twelve weeks of each year. Undertime time adjustments could be made for four hours per week for twelve weeks each year in some cases, though undertime adjustments could always be made by paying the workers even though they were not working. Another possibility is that overtime occurring on one day would offset undertime on another day since the weekly guarantee would be met.

Medium Run

The medium run adjustment is a rate change. This change involves adjustment in the combination of labor and equipment. Since equipment is considered a long-run adjustment the factor that will be changed in the medium run is labor. More or less labor will be used in combination with the equipment which results in the equipment being used more or less intensively. Plant capacity is usually given in terms of head per hour which is the rate at which the plant operates. Another term that has arisen with the use of the on-the-rail technology is chain speed. In making a medium run adjustment the plant manager will either add to or subtract from the normal labor force. If the normal labor force has been operating at peak efficiency, a subtraction in the force will mean that less animals can be processed per unit time, thus the rate or chain speed will be less. If a larger labor force is used, under the conditions assumed above, the rate or chain speed will be greater. The rate adjustment has been designated the medium run because this adjustment cannot be made in as short a time period as can the time adjustment. New workers cannot be hired and be expected to be able to perform well that same day. A training period of two weeks to a month is normal for training an inexperienced worker to be an efficient laborer in combination with on-the-rail equipment. In practical application trained workers cannot be hired or layed off on a daily basis, first, because of the working agreements and contracts and second, because this would strain good labor relations. A cut in work force could be made on the spur of the moment by termination. However, if the workers are union employees, termination can take place only for just cause. Normal fluctuation in demand or supply is not considered a just cause. A weekly work crew adjustment would be the maximum frequency of adjustment and common sense would indicate that normal labor relations would become quite strained if workers were layed off too often even on this basis. In practice the rate change is made very infrequently. To increase the work force would require a training program of a month while decreases in the work force are usually made on the attrition basis, except on rare occasions where a contract with a buyer may be lost (which would probably indicate severe problems in the whole organization) or supplies are cut off due to some natural disaster.

While the labor input is the main variable in the short and medium run adjustments, the average total cost computations included fixed costs -- salaried labor, depreciation, taxes, insurance and interest; variable costs -- utilities, kill labor, supporting labor, and miscellaneous supplies and services.

Findings

Assume that the annual kill of a plant is 113,400 head which is the annual slaughter corresponding to designed capacity of the 60 head per hour plant. The plant could slaughter this number of cattle by working a normal time for a full year, but because of the fluctuations, the day-to-day or week-by-week or month-to-month slaughter will sometimes be more and sometimes less than normal operations at designed capacity. That is to say, the plant will vary its volumes due to the ineraction of indirect procurement costs, the in-plant operations costs, the selling costs, and product demand.

Figure 1 illustrates the cost relationships that were found to exist between the short and medium run.

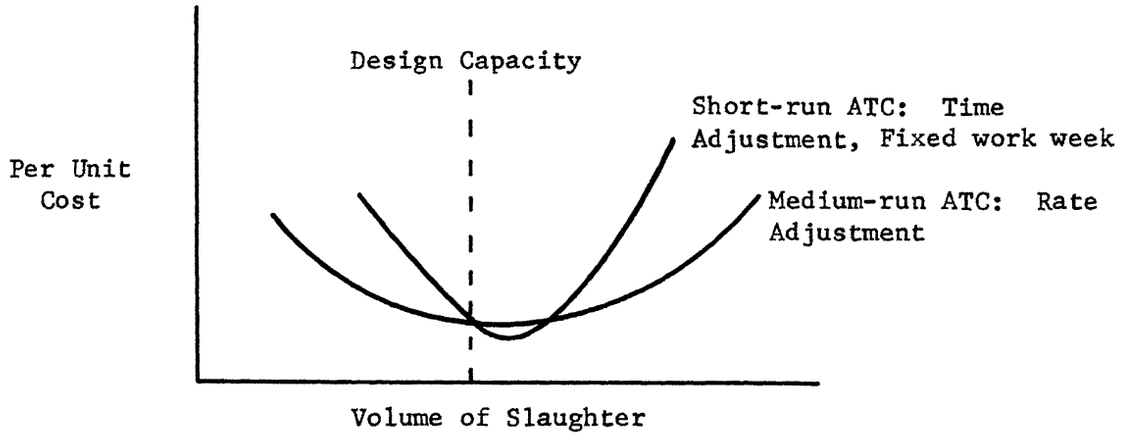

Figure 1

Short-Run Adjustments

It would seem that the ideal strategy for a plant manager would be to devise a procurement system that provides a quantity of cattle that permits operation of the slaughter facility through a time adjustment at slightly above design capacity--about 110 percent to be more definitive and about four hours of overtime for the workers. In part, costs are lowest at this point because slight overtime on the slaughter floor does not require a corresponding increase in supportive office labor, nor do additional payments need to be made to the various fringe programs like retirement, workmen's compensation, insurance and health, etc. The strategy of using a time adjustment and hoping for plant operation at about 110 percent of design capacity was followed by the majority of plants that were contacted in the Sioux City area. At this point we have agreement between theoretical and observed operations.

However, as was pointed out earlier, cattle numbers vary in the short-run. It is almost impossible to obtain cattle in the smooth flow that is required for lowest cost plant operation. In the short-run, cattle slaughter greatly in excess of the design capacity is not feasible, no matter how heavy the supply because of rapidly rising costs of expanded single shift operation, and the inability to employ multiple shifts due to cooler space limitations.

Still considering the short-run, in periods of low volume operations, the plant management would have two alternatives. It could adjust the crew size and operate at a slower rate, or the management could work the same crew undertime.

It is our opinion that for short-run fluctuations in volume, the undertime adjustment is preferred up to four hours of undertime per week. If the labor contract does not provide for shorter weeks, a rate change would be less costly but may cause undesirable labor relations.

Medium-Run Adjustments

Of more interest to this seminar is the medium-run situation. Plants must also be aware of medium-run fluctuations in the supply of cattle. When the cattle cycle is in a low numbers period, short supplies become chronic everywhere. On the other hand, cattle supplies are plentiful everywhere during a high numbers period. Short-run fluctuations are more area orientated and are of shorter duration in contrast to the medium-run fluctuations which are of a longer duration and are felt by the cattle industry in all areas.

The fluctuations of the cattle cycle obviously cause price changes at retail, wholesale, and live markets. An overly obvious hypothesis was established that retail prices react less to these changes in cattle numbers than do live prices.

Three multiple linear regressions were used to test the hypothesis. Each regression will be very briefly discussed. The input data for these regressions were collected for the years 1948 to 1965 on a quarterly basis.

Regression I: Price of Beef Wholesale = f (Retail Beef Price, Time, Consumption Change)

In this regression, the wholesale or carcass price of beef was the dependent variable. Independent variables were the retail price of beef, time, and the change in per capita consumption of beef.

The hypothesis is that the wholesale or carcass price is over-reacting with respect to the retail price. Theoretically, the regression coefficient for the index of change in beef consumption per capita should be zero as the change in consumption should be reflected in the retail price and, in turn, be reflected in the wholesale price according to the wholesale-retail differential. This is the regression coefficient we were most interested in when the hypothesis was tested, as a coefficient significantly different from zero would indicate that the wholesale price is a function of more than just the retail price. A significant negative coefficient would indicate an over-reaction as has been hypothesized.

Regression II: Live Beef Price = f (Wholesale Price, Time, Consumption Change)

In this regression, the live price of beef was the dependent variable. Independent variables were the wholesale price of beef, time, and the change in per capita consumption of beef.

The hypothesis is that the live price is over-reacting to changes in wholesale prices.

Regression III: Live Beef Price = f (Retail Price, Time, Consumption Change)

Keeping in mind the objectives of the previous two regressions, a third regression was run to test the effect of the retail price of beef on the fat cattle price.

In this regression, the live price of beef was the dependent variable. Independent variables were the retail price of beef, time, and the change in per capita consumption of beef.

As was the case in the previous two situations, the hypothesis is that the live price is over-reacting to changes in retail prices.

Regression Results

Table 1 shows the results of the three regressions. All coefficients in the table are significant to the .05 level.

Table 1: Regression Results

Regression	X_1 Dependent variable		Constant term (a)	X_2 Independent variable Wholesale	X_2 Independent variable Retail	X_3 Time	X_4 Capita consumption	R^2 Value
I	Wholesale price	=	-4.71121	---	+.71526	-.17733	-.40290	.96432
II	Live price	=	.20228	.64983	---	-.05458	-.28237	.90892
III	Live price	=	-3.02341	---	+.46703	-.17003	-.54359	.87818

Study of the resultant regression coefficients indicate that when consumption of beef is increasing or when cattle numbers are plentiful, the wholesale price will be lower than what the retail price would indicate it should be. When consumption decreases, the wholesale price will be higher than what the retail price would indicate it should be. Similarly when consumption of beef is increasing or when cattle numbers are plentiful, the live price will be lower than the wholesale price indicates it should be. When consumption decreases, the live price will be higher than the wholesale price indicates it should be. Finally, when consumption of beef is increasing or when cattle numbers are plentiful, the live price will be lower than the retail price indicates it should be. When consumption decreases, the live price will be higher than the retail price indicates it should be. Thus, these three regressions show that there is an over-reaction on the wholesale and live prices relative to retail prices. Furthermore, there is an over-reaction on live prices relative to wholesale prices. But, why the over-reaction? We feel that at least part of the over-reaction in live prices is caused by the cost structures of the plant.

As cattle numbers increase, the plant will experience lower costs by increasing overtime operations up to about 110% of design capacity. However, beyond this point costs rise quickly. Plant managers see no advantage in expansion of slaughter. Thus, as cattle numbers increase beyond 100% of design capacity, live prices fall faster than wholesale or retail prices.

As cattle numbers decrease, plant management continues to try to maintain design capacity, and only reluctantly makes time adjustments and only rarely rates adjustments. The result is that live cattle prices are bid up more quickly than wholesale or retail prices because plant management has focused its attention primarily upon the short-run cost curves.

Are the plants then acting irrationally in view of the above statements? Individually they are not because one plant following the optimum strategy presented in view of medium-run adjustments would curtail operations without lowering indirect procurement costs and would not be able to affect the live-dressed differential. As an industry, the plants are acting in an irrational fashion. By cutting back as an industry, response to short supplies, carcass buyers would be similarly affected and retail response should be quicker. Indirect procurement costs would be reduced so live prices would not go as high and would not overstimulate in and out feeders. The profits to the slaughter plants as a whole should be larger as indirect procurement costs and output would be more evenly balanced.

LIVESTOCK PRODUCER MARKETING PATTERNS IN THE UPPER MISSOURI RIVER BASIN

J. Marvin Skadberg
Iowa State University

Livestock producer marketing patterns have continued, over time, to undergo changes. During the early history of this country, most livestock was either slaughtered on farms or sold direct to local butchers in towns and villages. Marketing, at this point in time, was extremely simple, with farmers hauling their livestock to the local butcher for individual price negotiation and sale. As the country's railroad system began to develop, animals began to be produced at greater distances from the consuming centers; hence, cattle were shipped from the West and the Midwest to the slaughtering plants in the eastern metropolitan centers. Later, refrigerated railroad cars were developed, making it possible to ship meat greater distances without affecting the quality or edibility of the meat. The refrigerated car development made it possible for slaughter plants to relocate closer to the major livestock producing areas. This gave rise to the large Midwest slaughtering centers located at such railroad terminal cities as Chicago, St. Louis, Sioux City, Omaha, Kansas City, etc. These midwest cities became the major slaughtering centers of the United States. At these points, large supplies of livestock from the producing areas were collected, sold, and slaughtered.

Since large numbers of livestock were gathered at these slaughtering points, it was necessary to build stockyard facilities to hold the livestock. These stockyard facilities eventually evolved into the central public stockyards (terminal markets) as we know them today. A major portion of all livestock sold during the late 1800's and early 1900's was sold through these terminal city stockyards.

In the 1930's and 1940's, hard surfaced roads and improved motor trucks began to be used by livestock producers to transport their livestock to market rather than use railroads. Packing firms, aware of these trends, began to build new slaughtering facilities outside of the terminal market cities. This change in slaughter plant location caused the marketing pattern of livestock producers to change again. Farmers began to market their livestock direct to these interior located packing facilities; hence, the percentage of total slaughter livestock sales passing through terminal facilities began to decline. The decline in proportion of total slaughter receipts through terminals started in the 1920's for hogs, but did not dramatically shift in cattle until the late 1950's and early 1960's.

The study reported in this paper examines some of the basic factors which influence marketing patterns and the type of producer which patronizes certain types of market outlets in the Sioux City market area or the upper Missouri River Basin. It compares the type of livestock and the percentage sold to various outlets, the size of producers and the age of producer and if it influences producers' choice of market outlet.

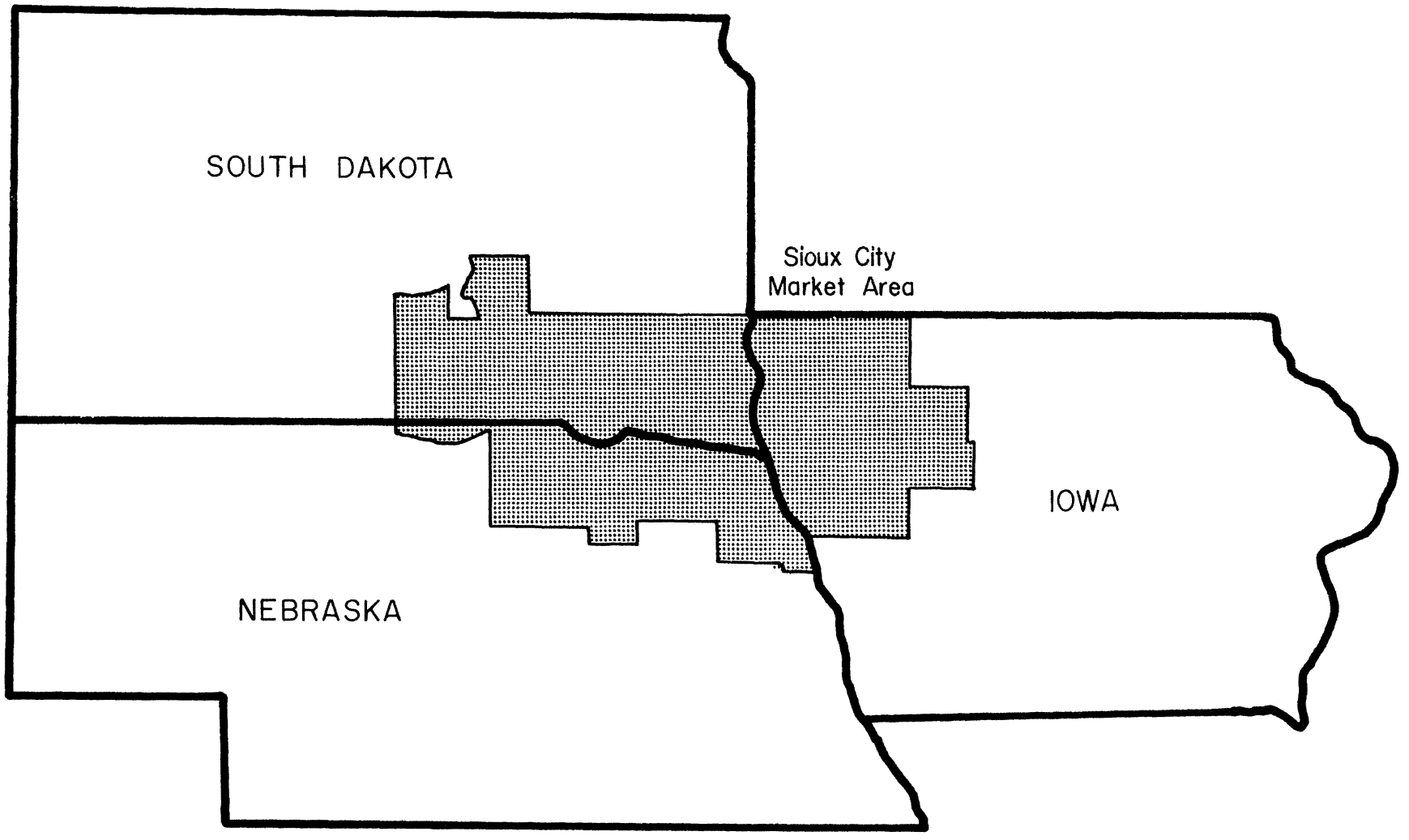

Figure 1. Sioux City Livestock Market Area

Table 1: Percent of Slaughter Livestock Sold Through Various Outlets in the Sioux City Market Area (1957 - 1967)

	Cattle		Hogs	
	1957	1967	1957	1967
	(Percent)		(Percent)	
Terminal Markets	72.9	55.0	49.2	31.5
Auctions	10.5	5.1	10.8	11.3
Packing Plants (Direct)	4.7	38.9	11.3	11.9
Buying Stations	----	----	23.8	35.5
Dealers and Others	12.3	1.0	4.9	9.8

Table 1 shows that the largest shift in marketing patterns was an increase in cattle sold direct to packer plants. Terminals showed the greatest decline in slaughter cattle receipts during the ten year period. Slaughter cattle marketed direct to packing plants increased from 4.7 percent in 1957 to 39 percent in 1967. The percentage sold through terminals declined from 72.9 percent in 1957 to 55 percent in 1967. The portion of slaughter cattle sold through auctions also declined from 10.5 percent in 1957 to 5 percent in 1967.

The marketing shift in hogs has been much less dramatic. The percentage of slaughter hogs sold through terminals declined from 49.2 percent in 1957 -- about one-half of all sales -- to 31.5 percent -- less than one-third of all sales -- in 1967. The number of hogs sold through the other outlets changed very little during the ten-year period and any differences shown could be due to misinterpretation by producer respondents or different description of the markets in the separate studies.

The remainder of this paper will summarize some of the findings reported in Ward's thesis, "Livestock Producers and their Marketing Patterns in the Sioux City Market Area," completed in 1967. (153)

Cattle Selling Patterns

Outlet choice on farm size. Farm size was considered a causal variable which could influence a producer's choice of marketing outlet for his slaughter cattle. The hypothesis was that farm size or number of cattle fed did not influence producers' choices of market outlets.

The regression model was as follows:

$$Yi - po + B1 \times i1 + ui$$

where Yi = annual number of cattle sold to each outlet
and xil = annual number of cattle fed per farm

The hypothesis was rejected for terminals and packing plants, indicating that size of feeding operation did influence the choice of one of these markets, but not auctions or local dealers.

Figure 2 depicts the equation graphically. The relative insignificance of change in local dealers and auctions is obvious. Estimations for packing plants have a much greater slope than for terminals, revealing the potential growth of sales direct to packing plants. The total number of cattle sold per producer has been increasing in this area. Therefore, if the present slope coefficients remain constant, the relative importance of direct sales as a producers' choice will exceed that of terminal outlets. The intersection of the terminal and packing plant regression lines indicates the farm size (number of cattle sold) where both outlets were used in equal proportions at about 260 head per farm. Above the 260 head per farm sizes, direct sales to packers became the most predominant method of marketing.

Market class and outlet choice. The distribution of cattle marketed according to sex has changed over time causing changes in marketing patterns. The problem was to the effect of changing market class on the total volume of cattle marketed to different outlets.

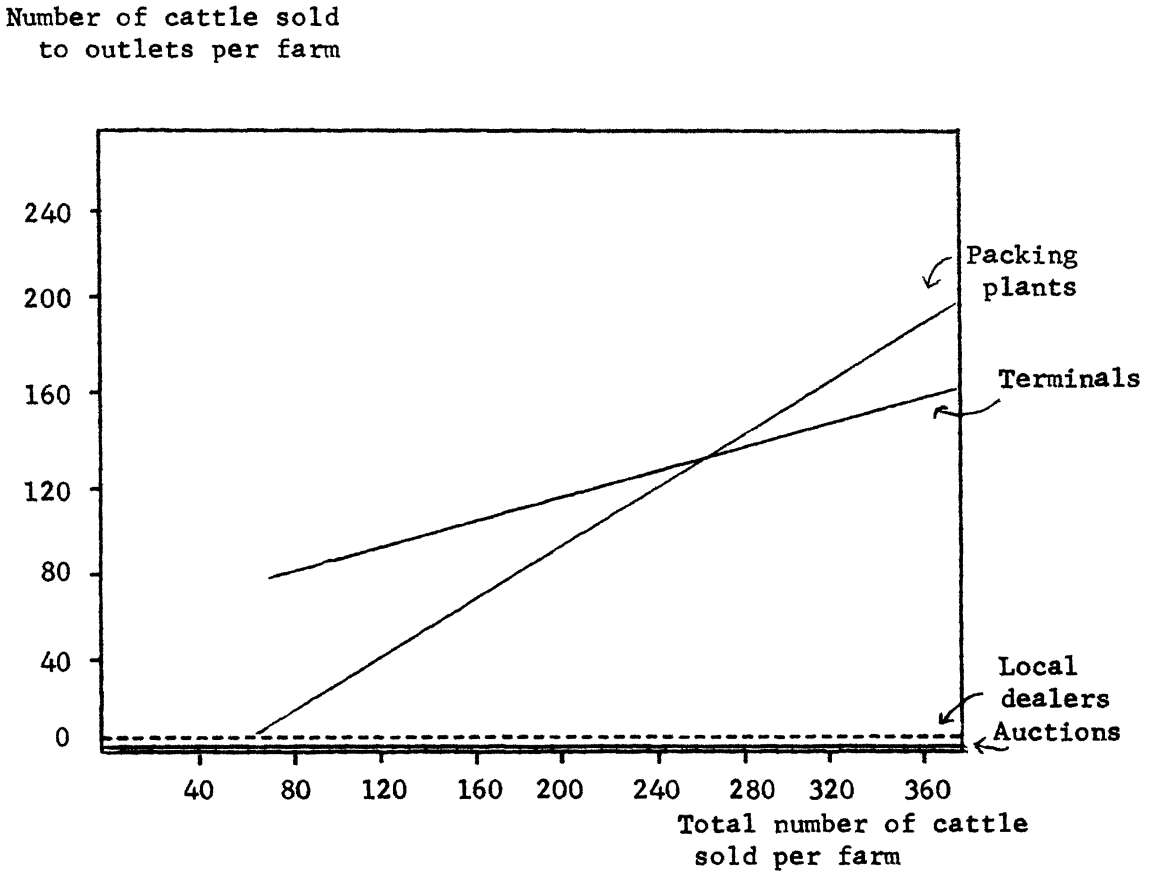

Figure 2: Regression estimates of outlets used as the total volume of cattle sold increases

Figure 3 illustrates the regression planes which were significantly different from zero. The estimates for auctions and local dealers were omitted because the results were insignificant. The figure shows that, as the number of steers and heifers sold increases, noticeable changes in marketing planes occur. Holding the number of heifers constant at some level, the figure shows that, if the number of steers sold is increased, the increase in the use of packing plants were proportionally greater than the increase in terminal use. In contrast, analysis shows that cattle feeders with concentrated heifer production sold their cattle principally through terminals. The terminal marketing plane was above the packer plane for all values on the heifer axis.

Cattle grades and outlet choice. Changes in a proportion of cattle sold by various grades have occurred, thus indicating a change in consumer preference.

Cattle sold within the market area were grouped into four different grade classifications as shown in Table 2. Approximately 12 percent of the cattle were sold as Prime, 66 percent as Choice, and 22 percent as Good. Outlet selling according to grades are shown in Table 2. Terminals are the chief outlet for Prime cattle 97.3 percent and Good 53.7 percent, while packing plants directly receive the predominant share of Choice cattle, 60.3 percent. Auctions provide a much more important market for Good grade slaughter cattle than any other grade.

Lot size and outlet choice. Marketing patterns of producers varied considerably with lot sizes of slaughter cattle. Lot size varied according to market class as well as with market outlet. Generally, slaughter cows, bulls, etc., were sold in much smaller lots than heifers or steers. Most cattle included in this study were either steers or heifers; therefore, the succeeding patterns according to lot size applied primarily to heifers and steers.

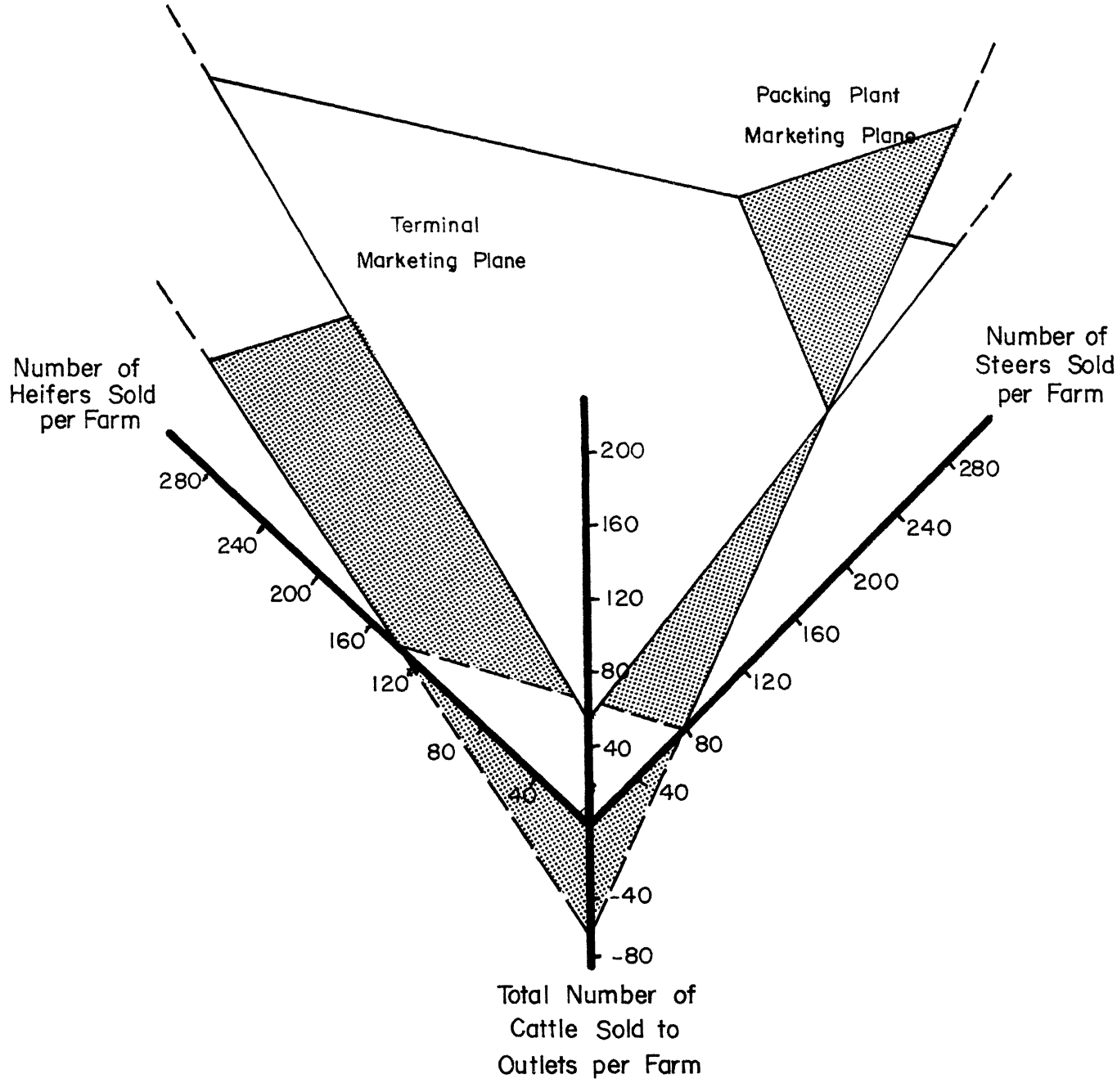

Figure 3. Estimated regression planes for terminal and packing plant marketing outlets with variation in market class of livestock sold to each

Table 2: Estimated percent of cattle going to each outlet according to grade sold.

Outlets	GRADES OF CATTLE SOLD[a]			
	Prime (12.07%)	Choice (66.01%)	Good (21.91%)	Others (.01%)
Terminals	94.25	36.48	53.70	----
Packing Plants	05.74	60.27	37.53	----
Auctions	00.01	01.17	07.43	----
Local Dealers		02.08	01.34	----
	100.00	100.00	100.00	

Lot sizes were divided into four groups as seen in Table 3. Results revealed that less than six percent of all cattle were sold in lots of ten or less head. Most cattle sold within the area moved in lots of less than 50 head. Cattle sales through terminals were most often in lots of 10 to 30 head. Packing plants served as the outlet handling most of the larger lot sizes. As seen in Table 3, approximately 64 percent of the cattle sold direct to packers were in lots of over 50 head. A relatively small amount of cattle were sold to packers in lots under ten head. Local auctions served as the producers' primary choice for cattle in the smallest lot sizes. Estimated sales to dealers were almost completely made up of cattle in the 30-50 head lot size.

Time of sales. Total cattle sales were divided into bi-monthly periods and then the distribution of volume to different outlets was determined. The percentages shown in Table 4 revealed a fairly uniform sale pattern of slaughter livestock through different outlets. Auctions showed the largest variation from 26.2 percent of their sales in the January-February period to a low of 11.2 percent in the March-April period.

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[a] Percents in each grade column were based upon the estimated number of cattle sold in each grade classification. Distribution of cattle sold at all other grades to different outlets was omitted since this involved a very small number of cattle.

Age of producer and outlet choice. Patterns of cattle sales were determined according to age groups of cattle producers. Table 5 traces the movement of cattle under each producer age group. As seen in the first and second columns, estimated percents indicated that younger producers tended to patronize packing plants, while terminals served as their second choice. Farmers 46 years and older indicated a much larger percentage of their cattle sold through terminals and a relatively smaller percentage went to packers.

Hog Selling Patterns

Outlet choice and farm size. Similar to the section on cattle sales, it was hypothesized that farm size would influence the volume of slaughter hogs moving through particular markets. It was determined that farm size did significantly influence the number of hogs sold to each outlet.

Table 3: Estimated percent of cattle sold according to lot size to each market outlet

Lot Size	Terminals	Packing Plants	Auctions	Local[a] Dealers
Under 10 head[b] (5.59%)	10.08	01.52	14.86	03.00
10-30 head (35.98%)	51.37	23.06	59.43	00.86
30-50 head (18.03%)	23.84	11.17	15.81	85.28
over 50 head (40.40%)	14.71	64.25	09.09	10.87
	100.00	100.00	100.00	100.00

[a]Percents based on the total estimated number of cattle sold to each outlet and the estimated number of cattle sold by lot size to each outlet.

[b]Percents in column of lot sizes are the estimated portion of all cattle sold according to lot size.

Table 4: Estimated percentage of cattle sold by producers in specified months

Bi-Monthly	Terminals	Packing Plants	Auctions	Local Dealers	All Markets[a]
Jan. - Feb.	13.57	15.96	26.19	15.57	14.98
Mar. - Apr.	15.91	19.83	11.16	16.46	17.93
May - June	15.94	13.37	17.64	18.10	14.64
July - Aug.	16.03	15.57	16.24	15.90	15.83
Sept. - Oct.	18.73	16.81	12.06	16.16	17.62
Nov. - Dec.	19.82	18.46	16.71	17.81	19.00
	100.00	100.00	100.00	100.00	100.00

Table 5: Estimated percents of cattle sold to each outlet by producers of different age groups.

Outlets	Under 25 Years	26-35 Years	36-45 Years	46-55 Years	Over 55 Years
Terminals	15.50	39.72	44.09	68.48	63.13
Packing Plant	84.49	57.32	51.87	29.26	33.94
Auctions	00.01	01.14	00.99	01.98	02.82
Local Dealers		01.82	03.05	00.28	00.11
	100.00	100.00	100.00	100.00	100.00

[a]Percents based on the total number of cattle sold to each outlet.

The equations are graphed in Figure 4. Linear estimated for volume to packing plants, auctions, and private dealers with a dotted line. It can be seen that volumes to these three outlets did change as volume of swine enterprises increased. The rapid growth of terminals and buying stations is indicated by the two solid lines. An increasingly larger proportion of slaughter hogs were sold through terminals or buying stations as the size of hog production unit increased. It is interesting to note that the slope of the terminal line is steeper than the slope of the buying stations or packing plants. However, the slope of the terminal line is influenced by the fact that very few producers with less than 80 hogs per farm sold to terminals.

Average weight of slaughter hogs. Slaughter hogs were generally sold on a liveweight basis; thus, it was expected sales to different outlets varied as the weight group of hogs varied. Prices for hogs are usually determined by the market system according to a generally universally accepted weight range. Therefore, differences in sales to outlets could have been a function of each particular outlet's pricing policies.

Aggregate movement of slaughter hogs for different weight groups have been set for in Table 6. Estimations revealed that over 32 percent of all hogs sold were sold at the weight of 200-220 pounds, while 61 percent were between 220-240 pounds. Most of the remaining hogs were heavier than 240 pounds, with only a few under 200 pounds.

Sale of slaughter hogs revealed that most of the hogs over 240 pounds were sold through terminals.

Lot size of slaughter hogs. Slaughter hogs were usually sold in larger lot size than were cattle. Over 90 percent of all slaughter hogs sold within the Sioux City area moved in lots between 10 to 50 hogs. Most hogs were sold in lots of 30 to 50 head, while a substantial number of the remaining hogs were sold in lots of 10 to 30.

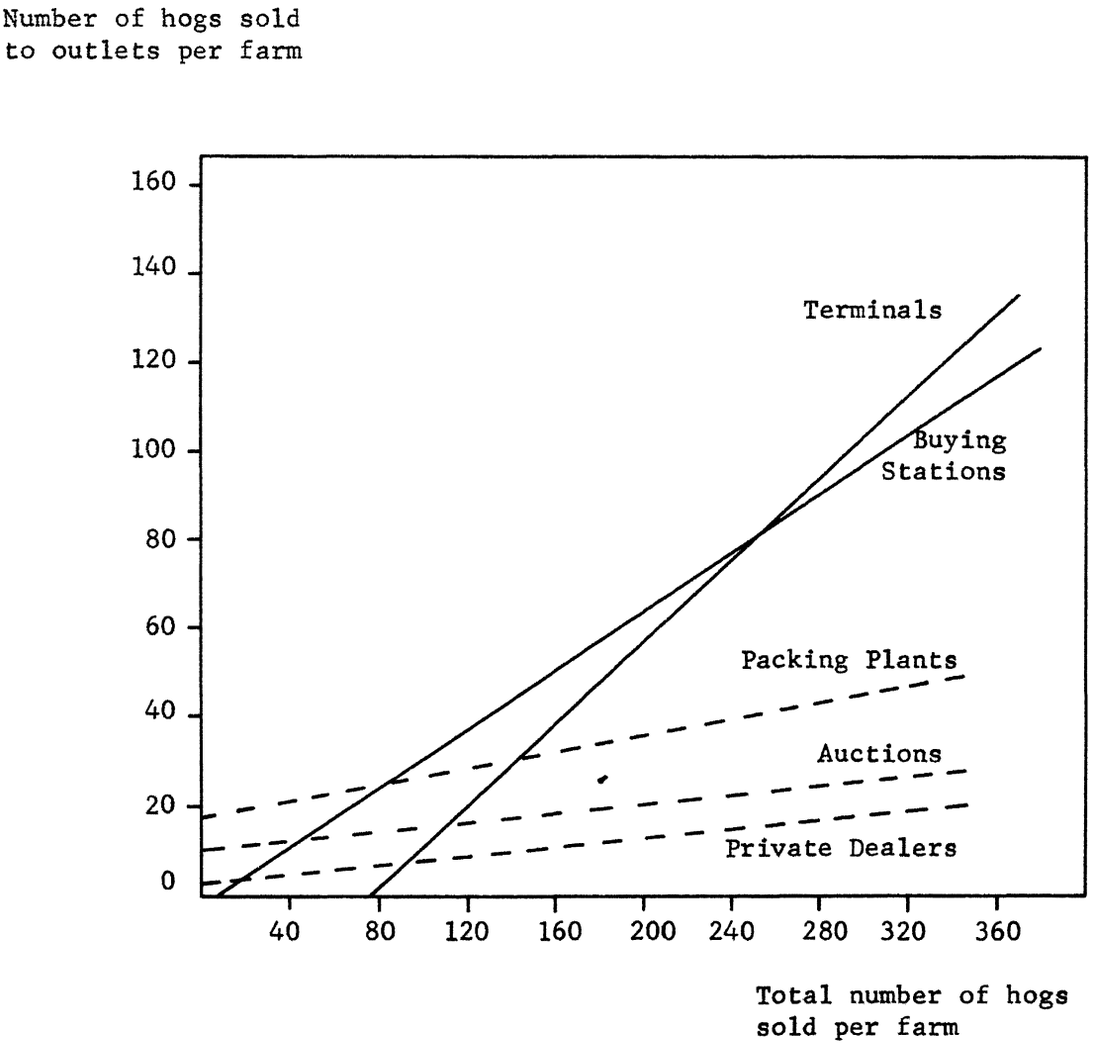

Figure 4: Regression estimates of outlets used as the total volume of hogs sold (per farm) increases

Table 6: Percentage distribution of slaughter hog sales to each outlet according to average weight of hogs

Outlets	WEIGHT RANGES (a)			
	Under 200# (1%) (b)	200-220# (32.64%)	220-240# (61.95%)	Over 240# (5%)
Terminals	--	24.70	38.02	57.15
Auctions	--	15.12	08.86	15.14
Packing Plants	--	09.67	12.87	06.53
Buying Stations	--	43.49	32.68	11.08
Private Dealers and Others	--	07.02	07.57	07.25
		100.00	100.00	100.00

Estimated selling patterns of hogs sold in each lot size are shown in Table 7. Those hogs produced in the market area and marketed through terminals were marketed primarily in lots of 30 to 50 hogs. Terminals and auctions receive very few shipments of 50 head or more. Auctions receive the largest proportion of lots of less than ten head.

Age of producer and outlet choice. Columns in Table 8 illustrate the importance of terminals and buying stations to all age groups within the market area. Two interesting statistics can be obtained from this table: 61 percent of the hogs sold by producers 55 years of age and over shipped to terminal markets while 88 percent of the hogs sold by producers 25 years old and under shipped to buying stations.

Summary

A study of producer marketing patterns in other areas would most likely show different marketing patterns, but this study does indicate that producers can be identified by certain characteristics, and, if they have these characteristics, they will tend to patronize particular markets. The study also illustrates the long-run trends in marketing

(a) Values under each weight range are the percents of hogs going to each outlet.

(b) Percents in the brackets are the estimated proportion of slaughter hogs in each weight range. Estimates for those hogs under 200# were omitted since this amounted to a very small number.

patterns. Since younger and larger producers, these are not mutually exclusive, tend to by-pass terminals and auctions that over time slaughter receipts at these facilities will continue to decline. This decline is due partly because the exit of older producers from agriculture or livestock feeding and a continual increase in size of livestock operation, larger producers also tend to by-pass terminal and auction markets.

This study also provides a producer profile for implementing any new or improved method for marketing livestock in the Upper Missouri River Basin. It would be difficult or almost impossible to institute a new marketing program or marketing techniques and expect producers to utilize it if it wasn't designed to fit the needs and demands of the producers in the area.

Table 7: Estimated percentage distribution of slaughter hogs within each market outlet according to lot sizes of hogs marketed.

Outlets	LOT SIZES OF HOGS SOLD				
	Less than 10 Hogs (1.66%)	10-30 Hogs (44.39%)	30-50 Hogs (47.53%)	Over 50 Hogs (6.42%)	
Terminals	00.39	39.28	54.79	05.54	100.00
Auctions	05.65	53.40	40.85	-----	100.00
Packing Plants	03.51	48.71	37.88	09.90	100.00
Buying Stations	01.20	49.62	41.27	07.91	100.00
Private Dealers and Others	-----	16.04	76.43	07.53	100.00

Table 8: Estimated percents of slaughter hogs sold to each outlet by producers of different age groups

Outlets	PERCENT OF HOGS SOLD TO EACH OUTLET				
	Under 25 Years	26-35 Years	36-45 Years	46-55 Years	Over 55 Years
Terminals	06.77	23.56	33.79	16.94	60.69
Auctions	-----	15.72	04.18	28.84	02.54
Packing Plants	05.06	15.72	14.37	07.33	13.05
Buying Stations	88.17	25.25	45.84	37.50	20.31
Private Dealers and Others	-----	19.75	01.82	09.39	03.41
	100.00	100.00	100.00	100.00	100.00

THE EFFECTS OF CHANGING PRODUCER MARKETING PATTERNS FOR SLAUGHTER LIVESTOCK ON TERMINAL AND AUCTION MARKETS

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The purpose of this paper is to discuss some of the effects of the changing marketing patterns of producers of slaughter livestock on the terminal and auction markets. Although the research results reported in this paper and the ideas discussed here are drawn from a limited study of the Sioux City Stockyards and auctions in South Dakota, I think they have relevance to more than the upper Missouri River Basin. I think they also apply to many other areas of the North Central Region and the United States.

This paper is organized into four parts. The first part discusses the terminal market and its problems. The second part discusses the auction markets. The third part deals with the implications of these changes for these two market institutions. And the fourth section discusses the implications for pricing in the livestock marketing system.

There are some peculiarities of terminal and auction markets which differentiate them from the usual production-oriented, profit maximizing firm. First, these markets exercise no control over and have little knowledge of the supply of livestock they will receive for a particular sale; thus, they have relatively little idea of the demand for their services until the sale day actually arrives. Second, there are wide seasonal fluctuations in the marketing of livestock which causes wide seasonal fluctuations in the demand for the services of these markets. Third, these markets operate under an administered pricing system which makes it impossible to vary the price of their services to optimize their net revenues during any one sales period. In aggregate, the economic implications of these factors are fairly obvious, i. e., higher unit operating costs, over-capacity, and little opportunity to optimize income.

The Terminal Market

The terminal market had its beginning in this country in 1865 with the establishment of the Chicago Union Stockyards. During the latter part of the last century and early part of this century, the terminal markets grew in number, size, and importance. Since 1920, however, they have experienced a declining share of the market, until today they handle less than one-third of all the livestock marketed.

Currently, the terminal markets are struggling to maintain their position and identity as an important part of the slaughter livestock marketing system. Skadberg's paper documents the by-passing of the terminal market by producers and suggests strongly that the rate at which producers will continue to leave the terminal will increase, particularly if their opportunity costs remain high. I will dwell briefly, here, on the packers and their declining dependence on the terminal markets as a source of supply.

In 1960 packers purchased 45.8 percent of all their slaughter cattle through terminals. By 1966, this percent declined to 31.0 percent, for a net decline of about 1/3 during the six year period. The corresponding figures for calves are 25.4 percent in 1960 and 15.7 percent in 1966, a net decline of 38 percent; for sheep, 45.4 percent in 1960 and 21.9 percent in 1966, a net decline of about 52 percent; and for hogs, 30.3 percent in 1960 and 22.1 percent in 1966, a net decline of 27 percent. See Table I. Evidence of the decline of the Sioux City Stockyards as a source of supply for packers is found in three events. First, the discontinuance of sheep slaughter by all plants located at Sioux City. Second, the decline of local slaughter of hogs as a percent of total hog receipts. This percentage was 70.4 percent in 1960 and 52.3 percent in 1966. And thirdly, the establishment within a few miles of the stockyards of a modern packing plant which relies almost exclusively on direct buying for its method of obtaining slaughter livestock.

The by-passing of the terminal market by producers and packers has resulted in some serious misallocation of resources and inefficiencies in the operation of these livestock markets. For example, one of the major problems facing the Sioux City terminal is the under utilization of their facilities. Assuming it was necessary for 50 percent of the available pen space allocated for sales at the Sioux City yards to remain unused in order to allow for maintenance and cleaning of pens and for the sorting of animals into uniform or special sales lots, less than half of the remaining 50 percent was utilized during the average week in 1966. Under this restrictive assumption, the pen space allocated to commission agencies for cattle and calves was utilized at only 35 percent of capacity. Similar figures for hogs and sheep were 48.3 percent utilization and 22.1 percent utilization respectively. The utilization of cattle pens allocated to packers for direct receipts and to dealers for their sales were 7.3 percent and 10.7 percent respectively, during the average week in 1966. See Table II. It should be obvious that if the 50 percent non-utilization assumption were relaxed these figures would show even lower utilization of capacity.

The overbuilding of facilities and their subsequent under utilization has resulted in very high investments and quite low returns on stockyards activities. Again Sioux City is a good illustration. The stockyards own 150 acres near downtown Sioux City. Its total investment in facilities was estimated for 1966 tax purposes at about 8 million dollars, including its subsidiaries. Its return on investment was about what could be obtained in government bonds. In short, the opportunity costs for these investments seem rather high. Incidentally, it is interesting to note that about 15 percent of the income at the stockyards came from subsidiaries and from activities not concerned with providing services for marketing livestock.

The by-passing of the terminal also has some important implications for the commission firms operating there. The supply of livestock at the Sioux City terminal is not great enough to afford efficient commission firm operations for all of the commission firms operating there. Many of the commission firms are so small as to be unable to reap some of the important economies of size. Recent research suggests that an increase in size from

60,000 animal units to 100,000 animal units annually is associated with a 15 percent reduction in cost per animal unit handled.(106) Further, the results indicate that economies can be achieved up to an annual volume of about 132,000 animal units. However, of the 23 firms operating at the Sioux City market in 1966, only 6 handled 100,000 animal units or more during that year, which suggests that substantial efficiencies could be obtained, probably without any serious impairment of the competitive atmosphere at the market, if fewer but larger commission firms were operating there.

In summary, the by-passing of the terminal has created some serious inefficiencies in the use of resources. The terminal markets, as we know them today, are a vestige of a livestock marketing system that has not adapted fully to the changing methods of marketing.

The Auction Markets

The history of the auction markets during the past half century has been almost the exact opposite of that of the terminal markets. About the time the terminals began to decline, the auctions began to grow and develop. The depression and the advent of new means of transportation and communication hastened their growth and development.

The auction markets have been and continue to be a small but significant source of slaughter livestock for packers. Both the number of livestock purchased by packers and the percentage of all livestock purchases made by packers through auctions has continued to increase in recent years. See Table III. Nevertheless, the future for the auction markets as we know them today does not bode as well as the past.

Today the auction markets are existing in a sort of vacuum. In a sense they seem to be practicing the philosophy that "all things come to those who wait." It seems to me that they may be at their apex in terms of their numbers and of their importance for marketing slaughter livestock. Their problems center around or are related to volume.

In many areas of the United States and particularly in South Dakota, the number of auctions is so large that none can achieve a satisfactory volume. This results in high operating costs per marketing unit sold. Lindberg and Judge show that the variable costs of auction markets drop as size increases to an annual volume of at least 75,000 animal units.(70) They also show that many of the economies of size or scale have been largely achieved by well-organized auctions designed to handle 20,000 animal units and that beyond the capacity of 35,000 animal units little further reduction in cost occurs. Murra and Mire report that an increase in size from 15,000 animal units annually to 30,000 animal units results in a savings at Georgia auctions of 57 cents per animal unit.(84) A South Dakota study show that an increase in size from 17,000 animal units annually to 41,000 animal units results in a savings of about 29 cents per marketing unit handled, and a further increase to 65,000 animal units results in another 14 cents reduction in costs.(10) All of this points up that auctions need not be exceptionally large to achieve costs levels approaching those of the largest markets.

Nevertheless, there are many small, inefficient, poorly located auction markets which have little hope of achieving these economies. The data in Table IV show that in 1962, 66.4 percent of all auctions in the United States handled less than 20,000 animal units. As more producers sell direct the hopes of these smaller auctions will be dimmer.

Adjustments to Change

Some of the terminals and auctions have recognized their problems and are attempting solutions. For example, some terminals, noting the success of auction markets, have established their own auctions. In general, however, these have not been overwhelming successes. Some terminals are considering the establishment of satellite yards. These satellites may become smaller versions of the current terminals or they may become collection points for livestock while pricing is accomplished via a tele-communications system connecting the satellites, the terminals and the buyers. In both of these instances the competitive atmosphere of the auctions will be altered. A few of the auctions, recognizing the transportation and pricing inefficiencies in the current system of marketing livestock, have developed the telo-auction. Stout has reported on the pilot project in Ohio whereby some auctions will allow bidding on livestock on the basis of liveweight or on the basis of carcass grade and weight.1/

In general, however, these measures are largely stopgap and as such may provide some short term relief to the terminals and auctions. In the long run, however, these markets must come to grips with the fundamental changes occurring in the two groups that purchase their services; namely, the producers and the packers. The educational level of producers is increasing rapidly and consequently producers are becoming more sophisticated in analyzing marketing alternatives. Producers are becoming more interested in marketing slaughter livestock through channels that provide reduced price risk and detailed feedback on grade and yield. Packers are locating new slaughter plants nearer the areas of supply. These new plants include the technological improvements which make it easy to purchase on grade and yield and to generate information useful for counseling producers. Further, the packers are interested in marketing arrangements which minimize procurement costs and assure them a continual and pre-scheduled supply. In short, both the packers and producers are moving toward closer coordination. To survive as an important part of the slaughter livestock marketing system, then, the terminals and auctions must adjust to meet these new demands. This will require some major shifts in the attitudes and outlook of managers of these markets. They will need to re-think their traditional role and consider how best to fit into the future system.

Implications for Pricing in the Marketing System

The by-passing of the terminal market has some important implications for the entire livestock marketing system, particularly in the area of pricing. First, the decline of terminals has resulted in changes in the traditional methods and procedures of price determination. More transactions are occurring off the terminal than previously and they occur in a decidedly different competitive atmosphere than those on the terminal. In many cases

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1/ See in this publication Stout, T. T., "Implementing Improved Pricing Accuracy For Cattle and Beef."

the bargaining position of the buyers and sellers are far from equalized, formula pricing has replaced open market bidding and buyers and sellers are often much better informed about the true market conditions. The result of all this is that it is virtually impossible to determine any kind of a representative equilibrium price for the market as a whole. Second, the decline of the volume of livestock sold through the terminal raises questions about the use of central market prices as representative of the supply, demand, and quality characteristics of livestock marketed. If, as many suggest, these prices are not representative then the signals transmitted through the marketing system by these prices are probably misleading.

Summary

In summary, the terminal and auction markets have problems. Most of them associated with or related to volume. They have been slow to react to changes occuring among the two groups that purchase their services; namely, packers and producers. Consequently, we find some serious misallocations and inefficiencies in the use of resources in the livestock marketing system. This, of course, is to be expected in a dynamic economy and especially in any industry undergoing rapid change, as is the livestock marketing industry. But, these problems should be viewed by people in livestock industry as challenges to seek "a better way" rather than as excuses for patching up the old system. One possibility for "a better way" of marketing slaughter livestock is presented in a succeeding paper in this issue. See the paper by Kendrick entitled, "Market Organization Alternatives -- A Better Way."

Table I: Percent of all livestock purchased by packers through terminals, by species, 1960-1966

Species	1960	1966	Percent Change
Cattle	45.8	31.0	32.3
Calves	25.4	15.7	38.0
Hogs	30.3	22.1	27.0
Sheep	45.4	21.9	51.8

Table 2: Percent of Total capacity of Sioux City Stockyards utilized, 1966
Utilization of Space of Sioux City Stockyards, 1966[1]

	CATTLE & CALVES		HOGS		SHEEP	
Sales	Head	Percent	Head	Percent	Head	Percent
Commission Firm Sales						
Average Week	24,406	35.0	33,542	48.3	4,654	22.1
High Week*	39,214	56.3	48,643	70.0	7,229	34.4
Low Week*	18,000	25.8	22,709	32.7	2,582	12.2
Packers Directs						
Average Week	493	7.3	98	.5	---	---
High Week**	1,533	9.1	249	1.2	---	---
Low Week**	249	1.4	0	0	---	---
Dealers Sales						
Average Week	2,164	10.7	---	---	---	---
High Week***	3,957	18.5	---	---	---	---
Low Week***	1,037	4.8	---	---	---	---

*Week of highest saleable receipts minus average weekly receipts of dealers during same month.

**Selected weeks in 1966.

***Weekly receipts of dealers not available. Figures represent average weekly receipts during month of highest and lowest dealers' receipts.

[1]Assumes that 50 percent of the pen space is not utilized in order to allow for maintenance and cleaning of pens and for sorting of animals into uniform or special sales lots.

Source: Powers, Mark J., "Livestock Marketing in the Upper Missouri River Basin: The Sioux City Stockyards, Facilities and Costs of Operation," North Central Regional Bulletin No. 188, South Dakota Experiment Station, Brookings, South Dakota, 1968.

Table 3: Summary of livestock purchases by packers through different market outlets, 1960-1964 1/

Year	CATTLE 1,000 Head	CATTLE Percent	CALVES 1,000 Head	CALVES Percent	HOGS 1,000 Head	HOGS Percent	SHEEP 1,000 Head	SHEEP Percent
				Direct Country Dealers, etc.				
All Packers								
1960	8,420	38.6	2,572	42.5	47,104	61.0	7,654	54.0
1961	8,714	38.0	2,384	37.5	42,791	59.6	8,591	52.3
1962	9,086	38.6	1,914	31.0	45,269	59.6	7,681	56.0
1963	10,518	43.1	2,031	35.4	48,354	50.7	8,493	56.0
1964	12,363	44.6	2,081	31.7	51,964	63.1	8,430	57.7
1965	13,455	45.1	2,351	34.3	46,613	62.9	8,127	62.4
1966	14,994	49.2	2,095	33.7	43,255	62.7	8,274	64.6
				Terminal Markets				
All Packers								
1960	9,987	45.8	1,538	25.4	23,356	30.3	5,020	35.4
1961	9,677	42.3	1,470	23.1	21,012	29.2	6,037	36.8
1962	10,030	42.6	1,436	23.3	22,304	29.3	5,504	35.4
1963	9,546	39.1	1,042	18.2	21,136	26.5	4,561	30.1
1964	10,124	36.5	1,231	18.8	19,608	23.8	4,180	28.6
1965	10,162	34.0	1,127	16.5	17,375	23.4	3,321	25.5
1966	9,434	31.0	976	15.7	15,246	22.1	2,803	21.9
				Auction Markets				
All Packers								
1960	3,399	15.6	1,940	32.1	6,695	8.7	1,493	10.6
1961	4,511	19.7	2,502	39.4	8,025	11.2	1,799	10.9
1962	4,428	18.8	2,823	45.7	8,461	11.1	2,356	15.2
1963	4,343	17.8	2,663	46.4	10,125	12.7	2,118	14.0
1964	5,244	18.9	3,242	49.5	10,801	13.1	2,007	13.7
1965	6,235	20.9	3,373	49.2	10,151	13.7	1,571	12.1
1966	6,028	19.8	3,153	50.6	10,458	15.2	1,722	13.5

1/ Summarized from annual reports of packers filed with the Packers and Stockyards Division, C & M S. Includes data for all firms purchasing more than 1,000 head of cattle, or 2,000 head of all livestock during the reporting period.

Table 4: Salable receipts of livestock at auction markets by size of market, animal unit base 1/, 1962

Size of Market (animal units) (000)	A U C T I O N M A R K E T S Number Markets	Number Animal Units (000)	Cumulative Percentage 2/ Markets (percent)	Cumulative Percentage 2/ Animal Units (percent)
Over 1,000	---	---	---	---
900 - 999	---	---	---	---
800 - 899	---	---	---	---
700 - 799	---	---	---	---
600 - 699	---	---	---	---
500 - 599	---	---	---	---
400 - 499	---	---	---	---
300 - 399	2	617	.1	1.7
200 - 299	2	580	.2	3.4
100 - 199	20	2,603	1.4	10.7
90 - 99	11	1,034	2.0	13.6
80 - 89	3	249	2.2	14.3
70 - 79	26	1,920	3.7	19.7
60 - 69	16	1,027	4.6	22.6
50 - 59	54	2,909	7.8	30.7
40 - 49	69	3,066	11.8	39.3
30 - 39	143	4,949	20.1	53.2
20 - 29	237	5,757	33.8	69.4
10 - 19	529	7,557	64.5	90.6
Under 10	613	3,336	100.0	100.0
TOTAL	1,725	35,604		

1/ Cattle equivalent (one cattle equals three calves, four hogs, or ten sheep.)

Source: Summarized from data supplied by stockyard companies to Livestock Division, C & MS, USDA, and Annual Reports of Posted Stockyards and Market Agencies (auction markets) filed with the P & S Division, C & MS, USDA.

MARKET ORGANIZATION ALTERNATIVES - A BETTER WAY

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The material presented in the papers by Powers, Skadberg and my earlier paper on packer costs, seem to say this about the Sioux City Livestock system:

1) Terminal markets are being used at very low utilization rates.
2) The younger and larger feeders seem to be marketing their livestock direct.
3) There seem to be monetary advantages to feeders and packers through direct selling.
4) That the smaller feeders may not always find packer interest in direct sales because of relatively small lot size.
5) That the internal cost structures of the packing plants may dictate an operational strategy that accents the observed cyclical pattern in live cattle prices.

If these five points correctly describe the Sioux City livestock marketing system then one is led to the conclusion that fundamental changes are, and will be, taking place. The large feeder is tending to sell direct, the small feeder is tending to market his animals through traditional terminal market complexes. Economic pressures are forcing this change.

Studies by the University of Nebraska(39) show that while the large feeder is not inherently more efficient than the small feeder on the production side, the large feeder gains his economic advantage in the marketing phases of livestock production, in the purchase of inputs and the sale of output. One of the major reasons for this marketing advantage of large feeders lies in the nature of the demand for carcasses. Buyers of chilled beef and hogs are demanding more uniformity in the carcasses they purchase. Packers, attempting to meet this demand, find that the assembly of sufficient volume numbers of cattle and hogs through small purchases, with varying quality lots, is a costly process; especially so when contrasted with the alternative of direct purchase from volume feeders.1/ Thus, the large feeder selling in quantity, of a general uniform quality, is in a preferred market position.

This means that terminal markets, and the packing plants associated with them, are moving toward the time when they will become the residual market for animals of varying quality, offered for sale in small lots. For the packer associated with the terminal, this means higher procurement costs for a given volume of uniform quality carcasses, and thus, an inferior competitive position.

But why the concern? The large feeders and those packers who are purchasing direct, appear to have the long run economic advantage. Why not

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1/ Packer procurement costs are discussed in the papers by Skadberg and Broadbent.

let the "forces of competition" determine the fate of the terminal markets and small feeder? There exists, I feel, two compelling reasons why some action should be taken. (1) The capital investment inherent in the terminal -- small farmer-feeder complex is much too large to dismiss with an indiscriminate wave of the hand of competition. Every time either a plant, yard company or a feeder goes out of business this represents a waste of economic resources -- resources that could still find productive employment if conditions were different. (2) While the packer who purchases direct and the large feeder seem to have the economic advantage, much could be done to improve the operational and pricing efficiency of both.

One method that might be used to improve the present pricing and operational system would be the establishment of a livestock pooling organization. Small feeders could pool their output and time their replacement stocks so that a steady supply of slaughter animals would be available to packers. The pooling concept could be evaluated by establishing a test organization.

To begin operations, the pooling group could contract with two packers having 75 head per hour capacities. The initial contract would be to provide 20 percent of each plant's annual needs (one day's kill per week). The marketing group would need to supply approximately 45,400 head of cattle per year, or about 870 head per week. This volume is available in the Sioux City market area from the small feeders who said that they would sell cattle under contract.

USDA standards for yield grades could provide the basis for a pricing system which would pay the producer more in accordance with the actual retail value of the animal he produced. Through contracts with the pool group to provide a certain number of animals per week, the terminal packing plants could be assured of a steady volume of a more standardized quality of animal. By eliminating the need for one or more of the plant buyers, this arrangement would reduce the plant's procurement costs, thus increasing operational efficiency.

During the six-month period, September 1967-February 1968, the average value difference between yield grades was 5.6 percent or $3.65 per cwt. Live selling has two disadvantages: 1) The producer is subjected to the overreaction of the live price vis-a'-vis the wholesale price, and 2) our present live marketing system cannot determine retail value.[2/] Thus, the suggestion that the farm value be based on the wholesale market.

It is felt that pricing efficiency could be improved by providing a closer linkage between farm and retail livestock values. As a halting first step toward this goal, farm value could be computed as a function of wholesale price. The yellow sheet, with all its limitations,[3/] could provide

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2/ An evaluation of live buying and carcass values is contained in the paper by Stout.

3/ The paper by Williams contains an analysis of "yellow sheet" prices.

the basing point for the wholesale value. The choice of the yellow sheet as a basing point is not perfect, but I feel that at present, the yellow sheet is the best single representation of national supply and demand conditions. The details of the pooling operation are as follows:

The computation of producer payments under this pricing system recommended would contain two steps. First, the producer's share of the carcass value could be determined by multiplying the carcass weight by the yellow sheet price, subtracting the transportation charge from Chicago to Sioux City, adjusting for yield grade, and subtracting a packer profit of one percent of sales, slaughter costs, and marketing charges. Second, the producer's share of the by-product value could be derived by multiplying the live weight by the estimated hide and offal value and then subtracting the packer profit and cost of preparing and handling the by-products. The total producer payment could then be obtained by adding the producer's share of the carcass value and by-product value.

The marketing pool would arrange the contracts between itself and the producers as well as the contracts between itself and the packers. The producer contract would require producers to deliver their animals to the packer on a 24 hour notice after being given a one week notice. In other words, on Monday of week one the pooling agency would notify the producer that he would have to deliver his animals to the packer during week two. Then during week two the agency will notify the producer at least 24 hours before he is to deliver his animals. The field man will keep in touch with the producers so the pool group will know when a producer's animals are ready for slaughter. Thus, the decision as to the week during which the producer's cattle are to be sold will be made jointly by the producer and the pool group's field men. Earlier in the year, the producer would have signed a contract saying that he would deliver a certain number of animals during a certain month. The month specified in the contract would be the same month that the producer would be required to deliver his cattle under the notice system described above. If the producer breaches his contract either by not delivering his animals on the day specified or by not supplying the number of animals called for in the contract, he will be assessed a $5.00 per head penalty for each undelivered animal.

To provide some flexibility in the system, the producer will be allowed to deliver five precent less than the contract amount without penalty. If the packer will agree to take extra cattle, the producer can then sell more animals than listed in the contract.

The packer contract would require the packer to take a certain number of animals per week from the pool group and to pay for those animals as carcasses under a system of discounts and premiums based on yield grade. The number of animals taken per week by the packer would be determined in a joint bargaining session between representatives of the pool group and the packer at the time the original contract was drawn up. If the packer breaches his contract by not taking the number of animals specified in the contract, he will also pay a $5.00 per head penalty to the producer for the number of cattle he failed to purchase. Through advance joint bargaining, the packer might have the privilege, on a week by week basis, of stating

which day or days he wanted the animals delivered. He would have to give notice to the pool group at least 24 hours before he wanted the cattle delivered. Thus, the packer could have all of the cattle contracted for delivery on one day or spread over several days. The opportunity to pick the day on which cattle are to be delivered with only a 24 hour notice would be helpful to the packer in controlling his inventory of slaughter animals. If, for example, on Saturday the packer determined he would not have enough cattle on hand for Monday's slaughter, he could notify the pool group that he wanted all or part of his weekly quota of cattle delivered on Sunday to be ready for Monday's slaughter.

The route of payment for the cattle could be as follows: The packer would pay the pooling agency and then the pooling agency would pay the producers after subtracting marketing charges. A partial payment could be made to the producers at the time of delivery if deemed necessary because of the time lag in determining the total payment to be made.

There could be several alternate ways of establishing the proposed pool group; for example, merging with an already established terminal commission firm or forming a new group. However, these possibilities would have to be analyzed at the time of the formation of the pooling agency in order to determine which possibilities actually existed at that time.

Perhaps the best method for carrying out the functions of the group would be one built upon a cooperative basis for several reasons: first, financing help would be available through the Bank for Cooperatives; second, any profits would be returned to producers in the form of patronage refunds; third, because the coop pool group would be controlled by the producers, they would be less hesitant about becoming members.

The internal organization of the pool could be of several types. One such organizational structure is illustrated in Figure 1.

Eighty thousand dollars per year is a very rough estimate of the overhead costs of the pool organization suggested in Figure 1.

If the pool handled approximately 45,400 head of cattle per year, the marketing charge to producers would be $1.75 per head. This marketing charge could be reduced if outlets for more cattle could be found either by contracting with more packing plants or by supplying more than one day's kill to the plants. The personnel and facilities illustrated would be adequate to handle a larger volume of cattle.

Obviously such an organization could be able to obtain financed credit and replacement stocks for the small feeders at more advantageous terms because of mass purchases, thus lowering feeder costs. Management advice could also be a part of such a pooling organization insuring that a more uniform product would result.

But farmer feeders will join a pooling operation only if there are dollar benefits. A very limited budgeting of costs and returns from pooling livestock suggest that there are monetary advantages.

ORGANIZATIONAL CHART

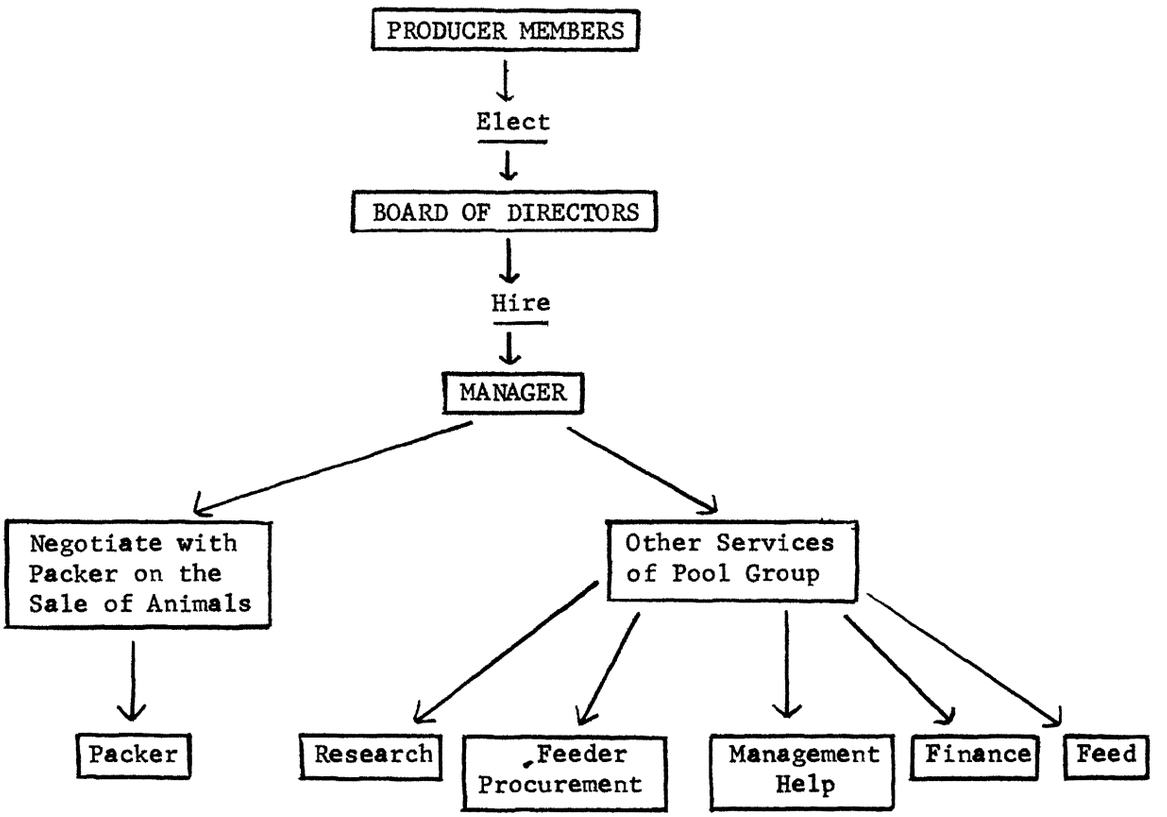

Figure 1

A random sample of prices for one day during each of the months of November, 1967, and February, May, and August of 1968 showed that producers would have received from 17 cents to $2.48 more for an average animal (3.2 yield grade) by selling through the pool group rather than the terminal market. The same four-day sample showed that producers could further increase their receipts on animals with higher yield grades. By increasing the yield grade one grade (3.2 to 2.2) the producer would have received $14.15 more for his animal on February 15, 1967; and $2.31 more for only a one-tenth of a yield grade increase (3.2 to 3.1) on May 15, 1968. This sample supports earlier statements that there are monetary advantages in direct marketing, but obviously more complete research is needed. So a livestock pooling operation has been suggested. The data presented have dealt with beef, but perhaps the same conclusions could be applicable to swine. Through the pricing arrangements of the pool, the wholesale and live markets have been more closely linked, and packers have been asked to work on a known margin. Realistically, packers will be willing to engage in such a pricing arrangement only when they can obtain differential prices for carcasses that more accurately reflect retail value. Perhaps the forthcoming introduction of "block-ready" beef will provide the needed price differential that will permit widespread carcass, rather than live, pricing to the farmer.

ALTERNATIVE MARKETING SYSTEMS FOR SLAUGHTER HOGS

Harold Riley and James Snell

Introduction

This paper focuses on comparisons of operational costs of alternative systems of marketing slaughter hogs. The observations and conclusions are largely based upon James Snell's recent doctoral dissertation in which he applied a synthetic, economic-engineering method of estimating costs of various methods of organizing the assembly market activities taking place between farm and slaughter plants in Michigan.(126)

The central objective of the research was to estimate operational costs of hypothetical hog marketing systems and to compare these with costs of the present system. It was anticipated that a major reduction in the number of auctions and/or local markets would permit scale economies leading to an overall reduction in total assembly market costs. However, the results of the analysis indicated that, under Michigan conditions, a shift to fewer and larger assembly markets would likely increase costs. In this comparison, the cost reductions due to economies of scale in auction and local market operations were more than offset by increased transport costs. However, shifting from the existing system to a direct farm-to-packer assembly market system could cut total operational costs by approximately 50 percent. In these analyses, no consideration was given to the relative bargaining positions of farmers and packers as they might affect the division of any potential cost gains from different marketing systems. Likewise, no attempt was made to evaluate the relative pricing efficiency of the marketing systems considered.

The Michigan Swine Industry

It will be necessary to briefly review some of the structural characteristics of the Michigan swine industry as background for evaluating the research results which are being reported.

Michigan farms are producing about a million hogs a year. This provides about 27 percent of the pork-consumed in the state. Another 15 percent of the pork supply is imported as live animals, with the remaining 58 percent being imported as fresh or processed pork products.

Over 90 percent of Michigan hog production is in the lower half of the lower penninsula. Production density is relatively low. In most of the major hog-producing counties the density of sales ranges between 50 and 90 hogs per square mile per year.(79)

In 1964 the average farm producing hogs in Michigan sold 74 head. Although production units are still relatively small, there is a sharp upward trend in size of units and a corresponding decline in numbers of farm producing hogs.(79)

Auctions and local markets are the principal market channels for Michigan slaughter hogs. The 1956 regional survey showed 58 percent of the slaughter hogs moving from farms to auction markets, 20 percent to local markets, 11 percent to terminal markets and 9 percent direct to packers.(91) Since that time there has been a further shift away from the terminal and an increase in the importance of local markets. In 1965 there were 52 auctions in the state and 15 local markets that handled hogs.

Michigan commercial slaughter plants are numerous and relatively small. There are 21 hog slaughterers that kill more than 5,000 head per year plus many other smaller operations. In 1965 the USDA reported 174 commercial slaughter plants in Michigan. Approximately 50 percent of the slaughter capacity is located in Detroit.

Research Procedures

The synthetic method of cost analysis was used as the basic research method for estimating costs of alternative marketing systems. The study was limited to the stages of operation beginning with movement of hogs from the farm and ending with the animals delivered to the holding pens at the slaughter plant. Three market channels were considered -- auctions, local markets, and direct to packers (Figure 1). Using data from previous studies plus supplemental information from existing market agencies, it was possible to derive cost estimates for the different stages of operation in each of three market channels.1/ The auction channel included five sizes of units. The local market channel included four sizes of operations. Similarly, packers were categorized into four sizes.

Transportation costs were derived from rate information obtained from commercial truckers. This resulted in step function cost relationships reflecting both variation in lot size being shipped and the differentials in rates by distance.

The present location and size distribution of producers, marketing agencies and slaughterers were specified to approximate current conditions. However, some of these environmental conditions were later modified for subsequent estimates of marketing costs under alternative sets of structural constraints.

Some of the details of the estimating procedures used in the study are summarized in an appendix to this paper. Further detail can be found in Snell's doctoral dissertation. Once the component cost estimates had been developed, it was possible to utilize a computer programming routine to carry out the final cost estimations for alternative market systems.

1/ This study drew heavily upon the work of Richard Gibb (44).

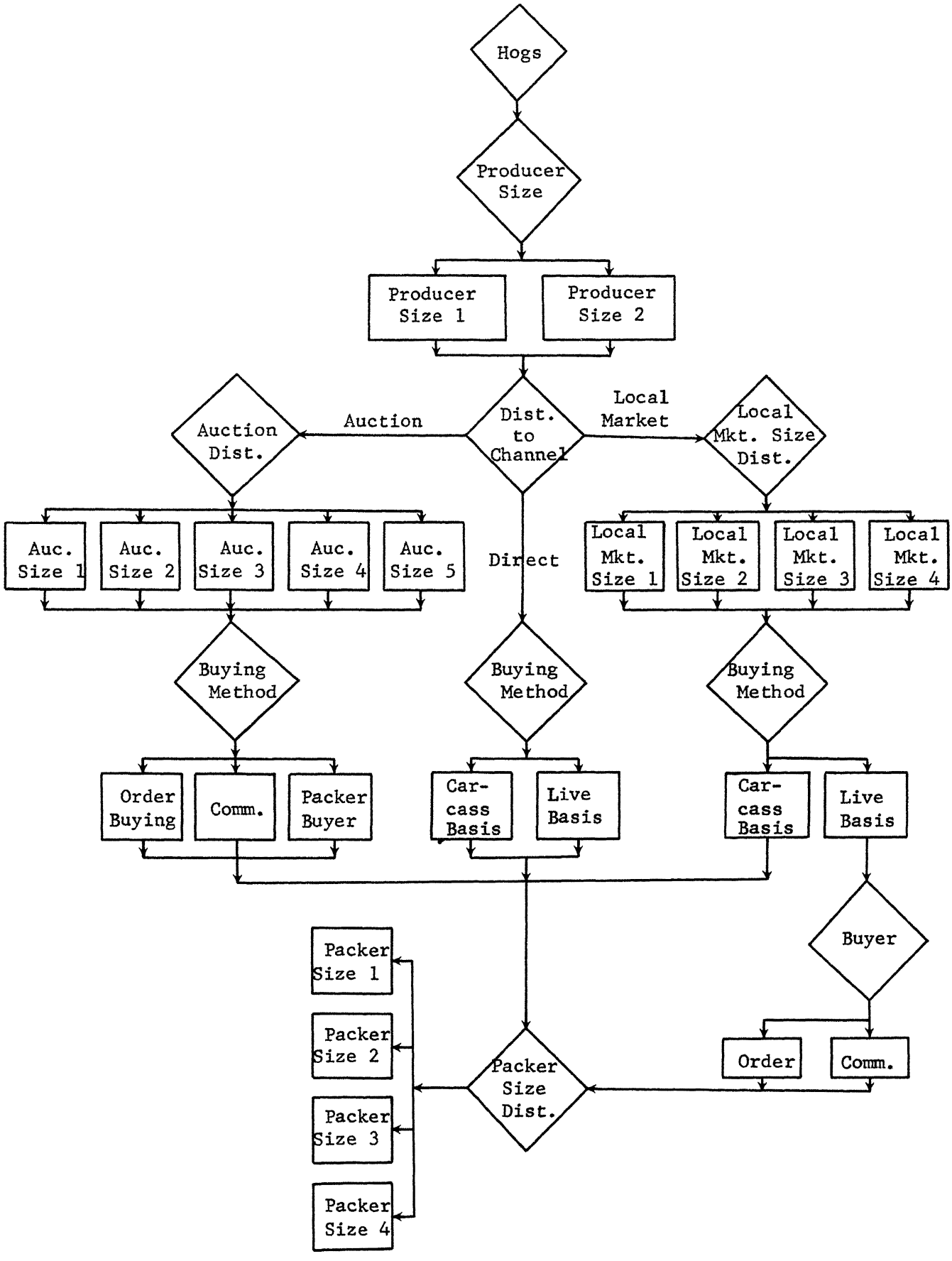

Figure 1. The conceptual model of alternative marketing systems for the Michigan slaughter hog industry.

Results of Cost Comparisons

Following these procedures the cost estimates derived are not actual costs of the present system, but something approximating the lowest costs that might be achieved if all agencies were operating at the minimum point of their short-run average cost curve.

The average per head cost of marketing Michigan hogs through the synthesized present system was $4.05. This was based upon the 1960-65 average annual volume of 1,007 head. In the present system, about 60 percent of the hogs moved through the auction channel. If this same proportion of the hogs were moved through fewer and substantially larger auctions (110,000 head per year units), the average cost per head sold through this alternative system rises slightly to $4.08. Shifting to a system where 100 percent of the hogs move through large 247,000 head per year auctions increased per head costs to $4.53. (Table 1)

A system of marketing all slaughter hogs through large local markets (100,000 head per year units) would reduce per head costs to $3.66. However, shifting to larger local markets (300,000 head per year units) increased costs to $3.91 per head. As expected, the lowest cost assembly market system was direct selling to the packer, with a per head cost of $1.98.

A second set of cost estimates were made for a modified set of environmental conditions which included fewer and larger producers and substantially fewer and larger slaughterers. This significantly reduced marketing assembly costs for all of the synthesized alternatives when compared with present environmental conditions (See Table 1).

Concluding Observations

This study did not attempt to determine an optimum or "best" marketing system. Rather, it provided relative operational costs of moving Michigan slaughter hogs through alternative assembly market systems. The "synthesized" lowest cost that could be achieved with the present slaughter hog marketing system, given the existing pattern of production and slaughter, was estimated to be $4.05 per head. The "actual" cost of the present system may be above or below this level. However, the "synthesized" costs provide a useful benchmark against which to compare alternative marketing systems operating under either present or modified environmental conditions.

It can be concluded that a shift to fewer and much larger auction markets would likely increase costs. However, it may be that a more modest shift to larger auction outlets would reduce costs. It seems clear that shifting to a direct to packer system would achieve large cost reductions. But this system may pose significant problems unless packers and farmers can work out a satisfactory means of coordinating the quantity and quality of hogs flowing through the system. It continues to appear that significant reductions in wholesale pork product costs might be achieved by improved vertical coordination between the production and slaughtering phases of the industry. Perhaps this could be better verified by the application of a synthetic study that would cost out some alternative arrangements.

Table 1: Average Total Costs Per Head for Alternative Systems of Marketing Slaughter Hogs in Michigan

Marketing System	Average per head cost: Present Conditions[a] (dollars)	Average per head cost: Modified Conditions[b] (dollars)
Present System[c]	4.05	3.50
Present System with 110,000 head/year auctions	4.08	3.68
Large Auction System with 247,000 head/Year units	4.53	4.18
Large Local Market System		
with 100,000 head/year units	3.66	3.31
with 300,000 head/year units	3.91	3.55
Direct to Packer	1.98	1.71

[a]Specification of present conditions
1. Producer size -- 33.3% of hogs shipped in each lot size, 5, 15, and 30 head.
2. Packer size -- eleven 5,000 head/year, four 35,000 head/year, four 150,000 head/year, two 350,000 head/year.
3. Packer location -- Detroit, 50% of volume; Grand Rapids, 25%; and Saginaw, 25%.

[b]Specification of Modified Conditions
1. Producer size -- 20% of hogs shipped in lot size of 15 head, 50% in 30-head lots, and 20% in 150-head lots.
2. Packer size -- four 350,000 head/year.
3. Packer location -- 25% of volume at each of four locations: Grand Rapids, Kalamazoo, Jackson, and Saginaw.

[c]Specification of present system
1. Market channels -- 60% to auctions, 20% to local markets, and 20% direct to packers.
2. Auction sizes -- 23 handle 10,000 head/year, 17 handle 35,000 head/year, and 12 handle 80,000 head/year.
3. Local market sizes -- seven handle 5,000 head/year, five handle 15,000 head/year, two handle 30,000 head/year, and one handles 100,000 head/year.

A-1

APPENDIX

Computational Procedures for Estimating Operational Costs of Alternative Hog Marketing Systems

As shown in Figure 1, the model is broken down into five major parts for the actual computing of the operational costs for the various systems. This separation was made in order to be more explicit in determining the effect of the various parameters and exogenous variables and to facilitate computer programming. By estimating transportation costs for the possible number of marketing agencies previous to solving the model for the needed firms and by predetermining the packer's location, it was possible to have only the one variable parameter, number of marketing agencies, generated internally by the model. This greatly eased the problem of computer programming.

The five major separations of the model were:

1. Auction operational costs
2. Local market operational costs
3. Packer operational costs, excluding transportation
4. Producer transportation costs
5. Packer transportation costs.

The first step in computing the marketing costs was to divide the total number of hogs going to a particular size of firm within a given channel by the capacity of that size of firm to determine the necessary number of firms to handle that number of hogs.[1/] Next, the number of firms was multiplied by the joint costs for that size firm to give a total joint cost for that number of firms. The number of hogs to that size of firm within the channel was multiplied by the variable labor cost per head to get a total labor cost. The total joint cost and the total labor cost was summed to yield a total operational cost for that size of firm within a channel. In brief:

$$TOC_{ijk} = \frac{H_{ij}}{C_{ij}} A_{ij} + B_{ijk} H_{ij}$$

where

TOC_{ijk} = total operational costs for the i^{th} size firm in the j^{th} channel using k^{th} selling method,

H_{ij} = number of hogs allocated to the i^{th} size firm in the j^{th} channel,

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1/ In the case of the synthetic present system, the number of firms in a particular size was held constant and if an excess number of hogs existed, this excess was reallocated to a larger size.

C_{ij} = capacity in head for the i^{th} size firm in the j^{th} channel,

A_{ij} = total joint costs for the i^{th} size firm in the j^{th} channel,

B_{ijk} = variable labor cost per head for the i^{th} size firm in the j^{th} channel using the k^{th} selling method.

For packers, buying costs from auction and local markets were computed with a composite buying cost as these costs are not affected by packer size. The percentage of hogs being purchased by commission men, order buyers or own buyer from the j^{th} channel was used as weights for buyers costs from the j^{th} channel (B.C.j.). Then the percentage of the total hogs being purchased from each channel was used as weights to give a composite buying cost (C.B.C.). In brief:

$$T.B.C._{A\ LM} = (C.B.C.)\ (H_A + H_{LM})$$

where

$T.B.C._{A\ LM}$ = total buying costs from auction and local markets,

C.B.C. = composite per head buying costs,

H_A = number of hogs in auction channel,

H_{LM} = number of hogs in local market channel.

The costs of direct buying were computed as follows:

$$T.D.C._{ik} = H_{Di}\ (B_{ik}) + (J.C.)_i$$

where

$T.D.C._{ik}$ = the total direct costs for the i^{th} size firm using the k^{th} buying method,

H_{Di} = number of hogs moving through the direct channel to the i^{th} size firm,

B_{ik} = the variable labor cost for the i^{th} size firm using the k^{th} buying method,

$(J.C.)_i$ = the sum of the joint costs for the i^{th} size packer.

However, the total direct cost for packers can be simplified since there are two distinct packer size distributions and the number firms of each size in each distribution are known. Therefore, total joint costs for each distribution were determined by multiplying the number of firms of each size by their total joint costs and summing for each packer size distribution to give the total joint costs for each packer size distribution.

The variable labor cost was also aggregated by using the proportion of the total hogs moving through the direct channels as weights. This resulted in a composite cost of labor in the direct channel (C.D.C.). In the case of packer size distribution II, there is only one size of packer so no weighting was needed. Total direct cost is them simply:

$$TOCD_1 = (C.D.C.)_1 H_D + (J.C.)_1$$

where

$TOCD_1$ = the total composite variable cost in the direct channel for the 1^{th} packer size distribution,

$(C.D.C.)_1$ = the composite variable cost for the direct channel for the 1^{th} packer size distribution,

$(J.C.)_1$ = the total joint cost for the 1^{th} packer size distribution.

Producer and packer transportation costs can be estimated by knowing the required number of firms necessary to handle a given number of hogs. Transportation costs are a function of lot size and distance shipped. Since the distribution of lot sizes is predetermined and distance for producers is determined by the number of marketing agencies (their location being previously determined), once the number of marketing agencies is known, the average transportation cost is known.

Some weighting of transportation rates must be done to adjust for different numbers of hogs to each channel. This was done by multiplying the average transportation rate for the i^{th} lot size distribution in the j^{th} channel ($A.T.C._{ij}$) by the percentage of total hogs moving through the j^{th} channel. This gives an average transportation rate for all producers. Packer transportation cost is a function of lot sizes shipped by packers and the market agency locations. Again, the distribution of lot sizes is predetermined, the two packers locations are predetermined and given the number of marketing agencies, their locations are predetermined. Therefore, as with producers, the average transportation costs are known.

The total operational costs of the marketing agencies and packer were converted in per unit costs to facilitate comparison and since transportation costs were estimated on a per unit basis, total transportation costs were not computed.

The total per unit operational cost for any given marketing system, given the number of hogs and the buying and selling methods, is the sum of the operational costs of the marketing agencies, the operational costs of the packers and the transportation costs for producers and packers in that system.

ARE WE WILLING TO ADJUST?

Emer E. Broadbent
University of Illinois

Situation

Consider the following:

1. Since 1946, the yearly volume of cattle marketed from U. S. farms has increased 81 percent; from 26 to over 47 million head. This is an average increase of one million more cattle marketed every year. Cattle marketed at 12 major terminal markets have decreased 2 million head since 1946. Since 1956, cattle marketed at the 12 terminals have decreased 4.2 million head. Not one terminal market now handles as many cattle as it did in 1956.

2. The United States now markets about 80 million hogs a year. This is 23 percent more hogs than we marketed in 1946, but since 1956 hogs marketed at the major terminals have declined by 5.7 million head. Terminals now handle about 20 percent of the salable receipts at public stockyards. Most terminals continue to lose volume.

3. Skyrocketing labor, investment, and operating costs have saddled terminals with rigid total fixed costs; at the same time they have a declining volume of business. Country marketing also involves high fixed costs. You are too well aware of the problems this creates.

Seven major adjustments typify today's livestock and meat industry:

1. More commercialization, custom feeding, and vertical arrangements in livestock production, feeding, and marketing. This involves more precise scheduling of livestock flow from feeder cattle areas, through feed lots and slaughter, to retail outlets.

2. More specialization and decentralization in livestock slaughtering with new "kill, chill, and ship" slaughtering plants located nearer to the sources of supply. This enables packers to bypass terminals as well as country buyers, thus reducing procurement and processing costs.

3. More fabrication of sub-primal meat cuts at the packing house level, and a trend toward shipment of boxed meats to chain store distribution points.

4. An increase in the concentration of bargaining power in the retail meat distribution segment of the market.

5. Continuing efforts to increase government involvement in "more orderly marketing."

6. A continued proliferation of low-volume, high-cost country markets. Illinois has over 341 hog markets, with an average flow per market of less than 30,000 hogs a year.

7. A definite problem of obtaining adequate market pricing information to guide the livestock and meat trade.

The net result has been a continued decline in the total as well as relative importance of terminal livestock markets as service agencies. The local, country markets tend to coordinate sales from small farmers at a relatively high cost. Terminals have not been able or willing to coordinate the flow of livestock between the producers and slaughterers of livestock. New organizations now tend to serve the large-scale commercial livestock producers. Both the country markets and the terminal markets have concentrated on traditional marketing patterns and one's personal loyalty from smaller producers. The big choice confronting traditional markets today is to either readjust and realign marketing services or face the inevitable.

What is the Potential Clientele and the Competition?

Today the United States has 2.2 million cattle producers, 1 million hog producers, and 200,000 sheep producers. They market 47 million cattle, 79 million hogs, and about 15 million sheep and lambs for slaughter.

Over 222,000 cattle feed lots are located in 32 major feeding states. But, 10 percent of the feed lots produce over half the total fed beef. In the near future, our livestock market requirements could be supplied by 100,000 cattle feeders, 50,000 swine producers, and 10,000 sheep producers.

The development of commercial feed yards has created new organizations that now handle more livestock than most livestock markets. Many commercial feed yards and their organizations now perform most of the services that terminals or country markets thought were their exclusive functions.

We have 55 terminal markets, over 2,200 livestock auctions, thousands of dealer markets and concentration yards, over 4,000 registered dealers, and more than 1,500 marketing agencies who help sell livestock. The ratio of marketing agencies to livestock producers is very high.

About 3,200 packing plants slaughter livestock, and 1,500 more fabrication plants process meat for retail sale. In addition, there are several thousand small locker plants and processors who perform livestock and meat-marketing services.

Actions taken by producers, processors, and meat distributors have already indicated the kinds of innovations and services the livestock industry wants. But, have the marketing people listened?

The location advantages once enjoyed by terminal markets have been modified by a complete reorientation of livestock and meat-marketing organizations in the United States.

1. Large meat packers have relocated facilities near surplus livestock producing areas. They buy direct at the door from producers, and use their own country buyers to obtain livestock. It's cheaper to ship carcasses than to transport live animals.

2. Local country buying organizations have "ringed" the terminals and intercepted the flow from producing areas.

3. Country order buyers and packer buyers coordinate the assembly, sorting, pricing, and flow of livestock from surplus-producing areas. They ship to packers located all over our nation.

4. Some large commercial feed yards provide producers with more services than those performed by traditional market agencies. Such feed yards represent some livestock speculators and producers in arranging credit, buying feeders and feeding livestock, and in dealing directly with packers for the sale of slaughter livestock.

5. Illinois terminals, as well as the country markets, have become mainly order-buying markets. They are saddled with a high fixed capital investment and high variable operational expenses. They must compete with coordinated country markets, feed yard markets, and direct packer-buying arrangements.

6. Some packers and country marketing firms use futures contracts to provide patrons with a guaranteed price. This service may be used before the livestock are produced. Cattle or hogs are produced on a known feeding margin. Stock may be delivered directly to the contractor on specified days. Price risks are reduced to a minimum. Shrinkage, transportation, yardage, and commission costs may be minimized. Such firms use Chicago and Omaha terminal prices as their basis for establishing price.

Some Major Changes in the Livestock Industry

The coordinated livestock and beef marketing operation of Iowa Beef Packer, Inc., at Dakota City, Nebraska, may typify the kind of market structural changes occurring in the livestock industry today.

1. They coordinate the buying activities of 62 feed lot buyers who operate in over 100,000 square miles of beef-supply territory located in more than five states. A micro-wave car radio-telephone communications system links the mobile country buyers with headquarters, providing close control of maximum prices paid. Records are kept of each lot that is bought, showing the number, cost, grade, sales, volume, and net returns. Each buyer is compared with other buyers. Through salaries and commissions, buyers are rewarded according to their relative efficiency.

2. They direct the flow of live cattle to one of their six country slaughtering plants. They also direct the shipment of carcasses to chain store outlets or to the Dakota City meat fabrication, chill, distribution facility. (They fabricate about 30 percent of their output for sale as sub-primal, boxed products.)

3. They direct and coordinate the activities of 34 beef salesmen who sell carcass or boxed beef to chain stores, hotels, restaurants, or institutional accounts.

Iowa Beef Pack is not concerned with traditional terminal or country market pricing. They claim their system eliminates the traditional marketing agencies, saves yardage and commission charges, and does away with most shrinkage associated with livestock marketing. They assert that this organization enables their buyers to pay farmers higher prices for slaughter cattle, gives their wholesale retail customers better quality meat at a lower unit cost, gives the ultimate consumer better quality meat at a lower unit cost, gives the ultimate consumer better quality meat at lower prices, and should enable Iowa Beef Pack to make substantial earnings for their services.

Sterling Dressed Beef in Colorado is a closed cooperative slaughter house that kills, chills, and ships a steady volume of over 600 head of beef a day to their outlets. They program the slaughtering of cattle at a specified rate, from thirty to sixty days before the cattle are ready to go to market.

Once a month, the slaughter house manager sends out a "feed lot kill request form" to his cooperators. It states, "I am requesting space through the month of _____, for _____ head of cattle, average weight _____, the approximate percentage of choice cattle will be _____."

This is signed by the feed lot operator. The plant manager totals up the number of cattle available, sets up a daily kill schedule, and makes an individual feed lot allotment - scheduling the number of animals and date when the feed lot operators are to make delivery. All beef are delivered early in the morning. They trim carcasses to buyer specifications. Settlement prices are based on yellow sheet quotations. The daily schedule facilitates carcass beef market planning well in advance.

Everything is government graded. Invoices show how each lot graded, the total weight, a price for each grade and weight class, the deductions taken, and the net amount going to the producer patron.

The volume of livestock slaughtered has more than doubled in the last two years, and it is still expanding. With this arrangement, there is complete organization and integration from the feed lot to the wholesale and/or chain store accounts. This arrangement completely eliminates the services of local markets and stockyard companies, cattle salesmen, order buyers, and the dealers and traders associated with the traditional system of marketing slaughter classes of cattle.

I understand that a singer, Jimmy Dean, is behind a group of investors who are building a similar kind of hog slaughtering plant and large-scale, confined, hog-feeding development in the High Plains area. They plan to sell most of their product on the West Coast.

Some Arrangements for Feedyard Operations

Many of the newer, large-scale feed yard organizations perform more marketing functions and services than were provided by either the country markets or the terminal livestock marketing organizations. Their activities include one or more of the following:

1. Setting up a record system to control and guide the buying, assembly, feeding, financing, and marketing of a steady flow of livestock through their facilities.

2. Organizing satelite or area feeder calf procurement and calf growing programs to obtain immature livestock and grow them on grass until they reach 650-750 pounds and then be moved into the feed yards. This requires vaccination, sorting, and classifying cattle into uniform lots before they are put on full feed for 120 to 160 days.

3. Negotiating with feeder-cattle buyers, feed suppliers, and packer buyers for an assured flow at the best price for livestock and feed; or, setting up their own organization to buy and grow out livestock, grow and store feeds, build and maintain feeding facilities, and control their own kill-chill-fabricate and distribution (packing) plant.

4. Coordinating feeder calf procurement and feeder growing programs with the sale of slaughter classes of cattle, so there is a steady flow of cattle through the feed yards at all times. This keeps fixed unit-costs at a minimum.

5. Arranging a materials handling program to buy, store, test, deliver, mix and feed a completely balanced ration for individual pens of livestock, thus obtaining maximum gains from cattle at the lowest cost per pound of gain.

6. Obtaining finances for underwriting the costs of operating such a coordinated marketing agency with credit institutions; or arranging custom feeding for speculators who are willing to underwrite this kind of operation. Financing can be planned by knowing inventories, the number of days on feed, feed conversion ratios, the kind and cost of the ration, cost of feeders, and sales price of beef, etc.

7. Analyzing the results of various buying, feeding, or fattening programs as a guide for marketing activities.

Our One National Market

Marketing agencies must realize they operate on a single national market. Packers are not concerned with the location of terminals, country markets, or feed yards *per se*, unless these agencies can provide the kind of livestock the packer needs, at the time he wants it, and at a favorable price. Packers balance local supplies against their market needs, then take price bids by telephone from alternative suppliers located in the surplus livestock supply area. They know approximate shrinkage and transportation costs from each area. Livestock and meat products flow from the concentration points or areas that offer the best, sustained deal for the packer.

The market demand for livestock located at terminals is essentially the same demand as is expressed by packers through alternative order buyers or salaried agents operating throughout the country.

To say that any one kind of livestock market is the competitive market and that it sets the basic price, simply disregards the market facts of life. Terminals, country markets, or packer markets are all phases of a complex, integrated marketing system.

The basic market demand is reflected by corporate and voluntary chain stores. They sell about 80 percent of all the meat sold at retail. Chain store buyers coordinate the assembly and distribution of meat on one national basis. The packing industry has relocated mostly in surplus-producing areas, but chain store meat-distribution centers are located in deficit meat-supply areas. The wholesale meat-distribution centers obtain what meat they can from local sources, but place standing orders with the central buying office to guarantee the distribution center a minimum volume of meat. The central office accumulates orders from all its wholesale meat-distribution warehouses, and takes bids to fill these orders from many packers located in surplus-supply areas. Shipping instructions are given to suppliers, informing packers where to transport carloads of meat to the wholesale distribution points. Prices are paid for the volume of meat as weighed and delivered at the distribution docks.

Similarly, a coordinated national system of hog supply and pork distribution operates for the swine industry. The Corn Belt states produce about 80 percent of the nation's hogs. Major hog-slaughtering plants have been and are being relocated in the surplus-producing areas to intercept the traditional flow of hogs that moved to terminal markets. Packer country buying stations and order-buying firms have been organized to direct the flow of live hogs from areas of surplus production to areas of deficit comsumption on orders from the packers. The packers have responded to their local retail demand and the local live-hog supply situation.

For example, a major packer organization with 30 or 40 slaughtering plants located in the surplus-producing areas coordinates supply with orders from its meat processing and distribution centers and with orders from other meat fabricators and processors located in distribution areas. Such organizations can know every hour or day what prices they get for carcasses and wholesale cuts in each alternative supply or distribution area. They know the transportation, service, and processing costs needed to handle the live animal, as well as the processed meat. By matching basic livestock supply information with meat market demand information and by making adjustments for transportation, service, and shrinkage costs, they issue buying and shipping orders to their alternative live-hog suppliers and direct the flow of either livestock or meat products so that the whole market complex operates as one, integrated national market.

Individual hog-slaughtering plants buy hogs locally and through order buyers, and sell meat products as described previously. They must compete with the national packers for live hogs and meat outlets. The coordination of national meat distribution operates much the same for pork and beef.

Innovations in Marketing Services

The structural change described above has been made possible by the development of explicit standardized market information between the marketing agencies. Trade is done on the basis of prearranged nomenclature that permits the buyers and sellers to understand each other. Settlement is made on the basis of verbal agreements subject to the supplier meeting the buyer's specifications. Neither the livestock nor the meat need be seen if both parties communicate and fulfill their commitments.

Chain stores specify the kind of meat they will buy from the packers. Packers are explicit about the kind or class of livestock for which they will pay given prices. The order buyers assemble and sort specific classes of livestock for shipment to their packer outlets. The terminal market agencies also usually sort stock into uniform lots before they fill their orders. Dealers often make a good margin of profit by buying heterogeneous lots, sorting them into uniform lots, selling the sorted lots at price increases, and absorbing the margin. The terminal and auction market personnel receive a commission fee for buying and selling livestock.

Can Existing Marketing Agencies Meet These Changes?

Why should the marketing people restrict their activities to local or terminal markets? Why not organize marketing where the greatest numbers of livestock are produced, and establish a marketing system that coordinates feed lot and country point marketing?

Market classes of livestock could be weighed, graded, and segregated into uniform truckloads of live animals and offered for sale via teletype or telephone to the highest bidder. Packer buyers could maintain a confidential identity, yet be tied into an area or national teletype hook-up with one, or a few, central selling offices that would list all lots of livestock available on a particular day. Teletype pricing could use the Dutch auction system.1/ Each buyer could sit in his own company office, watch the teletype listing of prices for different loads of livestock offered, and buy simply by pressing an electronic button to stop the teletype auction sale. The identity of the buyer would be known only to the master central market office teletype operator. Shipping instructions could be prearranged. Loads of livestock would move directly from producing areas to packer plants, with a minimum of delay, shrinkage, and transportation cost.

1/ The Dutch auction pricing would simply use teletype tapes that would be fed into the machine to start prices higher than the auction planned to receive for the livestock, but these prices would be decreased in 5-cent increments at a rapid rate; showing all the slave teletypes the same information. When the price had declined to a point where one buyer desired to bid, his pressing the button would stop all teletypes in the circuit. The bid would be offered immediately to continue with the sale.

Feed lot or country concentration markets, or both, could be established where all livestock could be weighed, graded, and classified into uniform truckloads of stock. Small lots of stock could be sorted, graded, and comingled with other small lots to make up truckloads with the same characteristics. These would be listed for sale along with cattle or hogs offered from one feed lot. Individual loads would be identified via teletype to the packer buyers, indicating the location, grade, class, and total volume of livestock available on any one day.

The marketing agency could charge a reasonable fee for their services.

One central accounting office, using electronic accounting equipment, could list and extend weight, grade, and price data for every lot of livestock bought and sold; compute deductions and marketing charges; and provide packer buyers, producers, and marketing agencies with a current analysis of all marketing transactions. Market operators could perform a very real competitive marketing service for the whole industry with such a coordinated marketing program.

The Ontario Hog Marketing Association has made this kind of program operational for years for all but the country sorting program.

This proposition would be opposed by traders, commission men, some stockyard operators, and packers. Anyone who stands to gain from buying heterogeneous lots and absorbing value differences from sorting and marketing uniform lots at higher prices, or who may have to work for his commission fee, would oppose such a change. But, this would let customers know the market was trying to do a job to eliminate excessive marketing costs (which may now be absorbed as trader or dealer margins.)

The "Chicago Order Buyer's" firm defied the traditional hog-marketing practices of selling on a weight-scheduled basis and began to buy hogs on merit of quality, or both. Last year, three men and a clerk handled 42 percent of the hogs sold from Chicago. They have been building greater volume of quality sales every year. Certainly, there will be a downward adjustment in the number, kind, and effectiveness of both livestock producers as well as the number of markets needed to serve them.

Are We Willing to Adjust?

Now is the time for action. Will we cling to the traditional marketing system, which has eroded before our eyes? Are we willing to make changes? Or, are we going to watch the big feed yards, new cooperatives, the government, or someone else absorb the increased volume of business? If the traditional marketing organizations continue to do business as they have in the past, a new coordinated marketing system will be created in our midst. This has happened in other parts of the country.

The livestock producers, meat packers, and distributors have long since demonstrated they are not dependent on either the terminal or the country livestock marketing system. Both the demand and supply sides of the market have indicated that some form of centralized market clearing agency is needed to coordinate the marketing of livestock and distribution of livestock products.

Are we willing to adjust?

SIZE, GROWTH AND STRUCTURAL CHANGE IN THE MEAT PACKING INDUSTRY

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Introduction

A thorough analysis of structural change must encompass many structural dimensions. Most recent market structure analyses have been cast in a broad, aggregate setting. The approach of the National Commission on Food Marketing is classic evidence.(86)

Our aim in this paper is not to rehash all the descriptive findings and conclusions of our efforts in Phase VI of NCM-25 and Phase I of NCM-36. We refer you to the publication if you are so inclined.(2) In this paper we are interested primarily in discussing how we came to the results and point out what we feel to be significant features of the analysis. We would hope by this means to raise questions and provide room for discussion.

Basically, there are four steps to our analysis. The first is description of the changing structural dimensions observed over the time period analyzed. Second is explanation of how and to a degree why these changes came about. Third is projection of future structure of the industry. Fourth is the extraction of economic implications from the whole process.

This paper is limited primarily to the changing characteristics of the size distribution of the federally inspected livestock slaughtering industry and to the two major processes underlying these changes: firm growth patterns and entry and exit patterns. In the analysis, characteristics of size structure were captured in several ways--by concentration ratios, Lorenz curves, and statistical measurements of the size distribution. This paper focuses on the size distribution. We believe that an industry size distribution is an important structural dimension which helps to understand structural change and, as we will argue later, may relate to performance of the industry.

Our work centered on the slaughter sector of meat packing, because we interpreted NCM-36 to be interested primarily in the demand side of the livestock market. All slaughter firms were not represented. The study included only those firms conducting slaughter under federal inspection (FI). This included all slaughter firms which entered interstate trade and thereby participated in the national meat market. These firms did the majority of livestock slaughter. In 1962, FI slaughter accounted for more than 83 percent of total head of livestock slaughtered. The proportion of slaughter under federal inspection has been growing since then. Developments and trends pertaining to FI firms carry broader generalization with respect to the entire industry. There is no reason to believe that major trends and characteristics reflected by FI firms would be altered if non-FI firms were included in the data.

If non-FI firms were included, the industry size distributions would probably show a greater number of small firms, a smaller average size, and

perhaps somewhat greater variation in size. Growth trends and patterns would probably be little different, although the smaller firm groups would perhaps have a slightly lower average rate of growth. This is suggested because it is usually a necessity to enter interstate trade to sell output as a firm grows larger. The size at which it is necessary to enter interstate sets a practical limit to growth of non-FI firms.

For the most part, data are from the 1950-1962 period. The major reason for using this period was that data from these years were readily available. Moreover, it is a rather desirable period for study. Many industry changes began appearing soon after 1950. Although most were the result of forces operating before 1950, significant impact began during this period. No claim is made that it is a particularly representative period of economic interaction in the slaughter industry. More importantly, for assessing the projections, one cannot be sure that impact of economic forces in 1950-1962 will be duplicated in the future.

In brief, the scope of this paper is limited in several dimensions. It is limited in industry coverage, in time covered by the data, in extent of analysis, and in prediction of the future.

Measurement of Size Distribution

The concentration ratio is a common structural characteristic. Changes in concentration of slaughter activity are well documented. However, to develop a point, we will review the trends which took place in this variable over the time period studied.

We looked at concentration in terms of the four and ten largest firms. Firm size was measured in number of head, annual slaughter. To assess total size for all species, we converted to average dressed weight. FI dressed weight was calculated for each state. National average FI dressed weights were adjusted to state FI dressed weight by using the ratio of state commercial to national commercial dressed weight.

There is substantial difference in concentration among livestock species. Concentration in all sectors declined, but sheep slaughter remained the most highly concentrated sector. Concentration of total FI slaughter in the four largest firms declined from 51% to 33% during 1950-1962. The same ratio for cattle slaughter declined from 52% to 28%; for hogs, from 49% to 37%; for calves, from 58% to 44%; for sheep, from 70% to 62%. Other data showed concentration of FI meat processing in the largest firms declined from 35% to 32% during 1961-1964.

While national concentration ratios may be relevant for the dressed meat market, local-market concentration is the more relevant statistic with respect to the livestock market. We recognize in approaching this question that we had a problem of identifying relevant "local markets". We used the regional breakdown identified in NCM-25. Thus, regional concentration ratios are indicative of broad area differences.

Concentration was greatest in New England--ranging from 77% for cattle to virtually 100% for hogs in 1962. In the East North Central Region the four largest FI firms slaughtered only 30% of the cattle and 37% of the hogs. The ratios tended to be declining in all regions except New England. However, calf and sheep slaughter concentration increased in the West North Central Region and sheep slaughter concentration increased in the East North Central Region.

These differences in regional and species changes in concentration ratios are largely explained by the pattern of new entry into the industry. A large proportion of the new entry from new capital took place in the North Central and Plain areas where concentration declined the greatest. This, of course, raises the question as to whether the time period selected--a period of market expansion in beef feeding--tended to dominate the situation in such a way that if some slow-down occurs in rate of increase in livestock production a readjustment toward concentration by the largest firm may occur. Entry patterns show this could be especially true for the North Central area of the United States.

Having looked at concentration, we took a more intensive look at changing size structure. Between 1950 to 1962, there was a moderate increase in average size of all FI slaughter firms. Relative size variation among firms showed virtually no change. There were, however, different trends among segments of the industry. While cattle slaughter firms grew more equal in size, calf, sheep, and hog slaughter firms grew less equal.

Statistics on the size distribution were calculated on logs of firm size. There are, basically, two reasons for using logs of firm size in this way. One reason is that the size distribution tend to approach normal distributions when size is expressed in logs. Thus, the statistical characteristics of the distribution tend to be more reliable measures, particularly when making comparisons among distributions. It was deemed important to have a good measure of mean size and variation to more fully describe size structure than could be done with concentration ratios. Inasmuch as it is possible to separate total change in mean and variance into changes among entering, exiting, and persisting firms, it was possible to assess the contribution of each group to changing size structure of the industry. The other reason for using logs stems from interest in the growth of firms. If firms in all size classes have an equal proportionate rate of growth, the industry size distribution will become log normal. Hence, an assessment of the log normality of the distribution is an ex post measure of growth equality.

Changes in the size distribution reflect entry, exit, and growth. Increase in average firm size occurred from two sources: a) growth, or increasing average size of the group of firms which were in the industry in both 1950 and 1962; and b) the group of entering firms had a larger average size than the group of exiting firms.

While overall firm size variation was roughly the same in 1962 as in 1950, there were different tendencies in size variation among groups. Variation in

size among the group of persisting firms increased. Meanwhile, the group of entering firms was decidedly less unequal in size than the group of exiting firms. There were, of course, different characteristics among entering, exiting, and persisting firms in each of the species segments of the industry.

In general, small FI slaughter firms were growing much faster than large firms during 1950-62. On the average, firms in the four smallest size classes more than tripled their size. Meanwhile, firms in the four largest size classes less than doubled their size. Among small firms there was also much larger variation in growth rates than among large firms. Among species segments of the industry there were also different growth trends. But, only in the calf slaughter segment were average growth rates equal among size classes. Patterns of growth also varied among the sub-periods within 1950-62, evidencing differences in both mean and variance of growth rates.

Firm Growth Analysis

It was hypothesized that there would be a measurable relation between growth and a set of variables often associated with firm growth. For these purposes, a multiple regression model related growth to initial size, vertical integration into meat processing, horizontal integration into multi-species slaughter, geographic dispersal of plants, and the firms prior growth record.

The regression model, with coefficients for 1950-62, is as follows:

$$G = 190.63 - 41.96S - .43V - 4.92H + .93N \qquad R^2 = .16, \quad Sy - 60.54$$

Where:

G = ratio of size of firm in 1962 to size of firm in 1950

S = size of firm in 1950 (log of total pounds, dressed weight slaughtered)

V = ratio of processing to slaughter in 1961 (vertical integration index)

H = number of species slaughtered in 1950 (horizontal integration index)

N = number of plants operated in 1950

Considering the low R^2 (coefficient of multiple correlation), the model obviously does not incorporate a substantial explanation of growth. But, the high negative coefficient on initial size and the positive coefficient on number of plants is of interest. It also appears that the index of hortizontal integration has a greater association with growth than does the index of vertical integration.

The same model was estimated for the periods 1950-54, 1954-58, and 1958-62 (with the addition of the prior growth variable for the 1954-58 and 1958-62 models) to see if significant differences appeared in the relationships as among different time periods.

Following these four calculations, it appears that size as such is inversely correlated with growth, even after separating its association from vertical and horizontal integration, spatial spread of plants, and prior growth.

In all periods, there is a negative coefficient on the variable reflecting vertical integration. The coefficient is small, but persists. It, therefore, appears that the greater the extent to which firms were involved in processing, the less they grew in slaughter.

There also appears to be an inverse relationship between growth and horizontal integration as it is represented by number of species slaughtered. But the nature of the relationship is unclear. For the entire 1950-62 period and for 1950-54, there was a rather sizable negative coefficient on the variable. For 1958-62 negative coefficient was quite small. For 1954-58 the coefficient became positive. During 1954-58, growth tended to be positively related to number of species slaughtered, which is in direct conflict with the rationale for the hypothesis on horizontal integration.

The relationship between growth and prior growth is almost zero. It is of interest that the sign of the coefficient on prior growth is negative, suggesting that, insofar as there is a relationship, firms which grew more in a prior period tended to grow less in a current period.

While this analysis was useful in quantifying some growth factors, it clearly does not answer the question of why slaughter firms grow. The most striking characteristic is the inverse relation between size and growth rates. There is an inverse relation between size class and both mean and variance of growth. Although the strong inverse relation did not appear in all segments of the industry, it was quite strong in cattle slaughter and calf slaughter.

Even though this study did not make a full investigation into all causes of growth, a line of reasoning does appear to fit the growth pattern. We suggest it is useful to think of three sets of factors relevant to growth. These are: 1) intrafirm factors, which are technical or organizational attributes of the individual firms in the industry; 2) interfirm factors, which are the commonly-considered structural or organizational attributes of the industry; 3) institutional factors, which are constraints which public policy places on business firm behavior. Within these headings we suggest there are a number of possible causes of the observed growth patterns.

To summarize our impressions, we think the following are important:

a) Scale economies, operating in a perverse way, i.e., small firms have a powerful incentive to grow out of their small size to attain the same advantages possessed by larger firms and thus have a higher rate of growth.

b) Patterns of technological change, favoring new firms, i.e., technology in former years was such that it favored the construction of large integrated meat packing plants. New technology has fostered development of smaller, specialized slaughter plants which were operated as firms.

c) More investment alternatives available to large firms so they have a greater probability of placing a bundle of investment capital elsewhere.

d) Advantage possessed by small firms in the labor market. These include community relations, low rate of seniority, etc.

e) Public anti-trust policy, constraining actions of large firms.

Further research would be necessary for more thorough evaluation; however, the factors fit the patterns of size change observed.

Size Structure Projection

As the growth analysis was originally conceived, it was anticipated that it would lead to identification of associated variables such that further precise predictions of future size structure could be formulated. This appears not to be the result. The analysis did show that initial size is by far the most important associated variable among those analyzed. The Markov-chain technique employed to project size distributions assumes that the probability of change in size depends solely on initial size of the firm. Hence, we apparently cannot appreciably improve on the predictability of the Markov procedure.

We looked at entry, exit, and growth intensively through matrices. These matrices also provided the vehicle for projecting future size structure. Shifts in entry, exit, and growth patterns within the 1950-62 period were analyzed through comparison of projections developed for different sets of years within the period. These projections revealed substantial changes in the matrix of entry, exit, and growth during the time period studied.

If the 1950-62 growth patterns were to continue, a somewhat different slaughter industry size structure would emerge in a few years. By 1998, more than half of all the FI slaughter firms would be in what is not the largest size class. A less radical change in size structure of FI cattle slaughter firms is implied by the projections. By 1998, the majority of firms slaughtering cattle would be still grouped near the middle size classes. Projected size structure of calf, sheep, and hog slaughter firms are only moderately different from 1962. If 1950-62 growth patterns continue in each of the industry segments, there will be a few more firms larger than the present average, and a few less smaller firms. But the change is not great.

Observations on entry, exit, and growth of slaughter firms form a "life-cycle" model of firms in the industry. This life-cycle is one in which a firm enters the industry at a small size, stays small for a few years as management gains experience, then either fails or has a period of rapid expansion to optimum plant size. The concept further suggests that the sum of

barriers to entry plus growth as the firm moves from small to optimum is less than the barrier against entering directly at the optimum. This idea was substantiated in this research where it was clearly indicated that on the average firms which entered by using "new" capital did so at a level less than optimum and also grew further than firms of equal size already in the industry at the beginning of the time period. Some time later, the firm may again grow internally by adding more plants or externally by merger -- these processes involving a different set of factors in and constraints on expansion than the growth of the single plant firm to optimum size.

It must be noted that our observations are from data gathered during a period of generally expanding livestock production. It would appear that this is of critical importance. Since agricultural processing firms handle all the supply offered (i.e., price adjusts to clear the market), expanding livestock production necessarily implies a growing slaughter industry. This also leads us to postulate equality of growth as a performance norm -- but we shall get to that point later.

Implications

Let us now return to a discussion of the concept of growth in the slaughter industry. We have used it as a descriptive concept, detailing the degree to which firms of various sizes and various resource endowments have survived and prospered. By this method we traced the sources of changing size structure of the slaughter industry. Examination of changing industry size structure through growth analysis was very helpful in understanding causes of change.

But we would like to suggest that growth concepts also have normative implications. We pointed out that if growth is randomly distributed with respect to size, the resulting industry size distribution is log-normal. Consequently, analysis of log-normality of the size distribution has definite implications about patterns of growth. If the size distribution is log-normal, it is probable that firms in all size classes have experienced common mean rates of growth.

We suggest the growth concept has normative implications from two perspectives. First, growth is a widely-held goal in American society. In a macro sense, growth may be said to be nearly a universal objective of firm management, stockholders, and private entrepreneurs. Analysis of growth with respect to size portrays the degree to which small and large firms are attaining the goal. More particularly in the meat packing industry, it reveals the degree to which small firms are obtaining a "fair share" of expanding livestock production.

The other perspective from which growth has normative implications is through the sequence of equal proportionate growth generating a log-normal size distribution. The conditions necessary for equality of growth closely resemble the conditions of pure competition. There is one notable exception; the dynamics of shifting resource supply in livestock slaughter. If most conditions of pure competition prevailed, and if livestock supply to slaughterers were allowed to shift, equal proportionate growth among sizes would be

expected. A measure of departure from equal growth is in this sense a measure of departure from the normative state of pure competition.

Statistical tests on the degree of difference of growth among size classes indicate that both the mean and variance of growth rates were significantly different. Hence, the "dynamically competitive" growth norm is not met. Small slaughter firms grew significantly faster than large firms during 1950-62. However, public policy may have an interest, not merely in providing an equal opportunity for small firms but in ensuring an industry of many competing firms. The apparent growth success of small firms indicates that this performance norm is being satisfied.

Other performance data is available, published by the National Commission on Food Marketing. These data show profit rates in the slaughter industry to be lower than in food processing, generally. There is rather low advertising expenditure in the slaughter industry. In recent years there has been considerable influx of new technology. This information, coupled with the growth data, indicates that performance of this slaughter industry is favorable in at least some important dimensions.

Concluding Questions

1. The most obvious question with respect to this analysis centers on whether economic conditions during 1950-62 allow one to go beyond projecting what kind of size structure we will have if conditions remain the same. Will livestock production increase as much and in the same regional patterns? Will the discrepancy in use of advanced technology and optimum location be as wide between the "established larger firm" and the "smaller new firm"? Will larger slaughter firms continue to move toward meat processing at the expense of slaughtering? Changes in these conditions could reverse the size distribution picture developed in 1950-62.

2. Does the life-cycle model advanced in this paper indicate the need for a somewhat new approach to the concept of barriers to entry? The mere entry of a new firm in an industry growing from small to optimum may not be as relevant concept as the ability to stay in the industry after reaching some advanced growth level. We suggest in this paper based on research in this project that the rate of turnover of new entrants indicates that the barriers to "staying" may be somewhat higher than barriers to "entry".

3. What other measurable factors affecting firm growth ought to be included in growth analysis?

4. Does the normative model of firm growth offer an empirical contribution to Bainsian industrial organization research?

CHANGES IN TRANSPORTATION AND THEIR IMPLICATIONS FOR THE LIVESTOCK AND MEAT INDUSTRY

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Transportation has traditionally played a significant role in the structural evolution of the livestock and meat industry, dictating location strategy and strongly influencing the pattern of interregional competition. The assembly-disassembly characteristic of the industry makes the transportation function a vital link in every phase of production and marketing.

For many years, because of lack of flexibility in the transportation system and the vogue for high capacity, multi-species packing plants requiring an assured supply of large numbers of animals, the slaughter industry found itself well served by the terminal market system of assembly and pricing of livestock. Cattle were funneled into the terminal markets in trainload lots, often from distant points. In 1919, at or near the peak of the rail movement of livestock, 64 major markets received more than 1,500,000 car loads of livestock. Forty years later, in 1959, receipts by rail at these markets had declined to about 150,000 cars.(61)

The importance of the motor truck in livestock transportation has increased phenominally since 1919. In that year, truck shipments represented less than two percent of total receipts of cattle at major public markets. By 1964, this figure had increased to 94.9 percent.(61) Since virtually all of the direct movement of cattle to packing plants is by truck, the actual percentage of all cattle marketings now moving by truck is even greater than these figures would indicate.

A 1956 study of methods of transportation used by West North Central cattle producers in marketing their livestock indicated the following distribution by mode.(91)

Commercial truck	68%
Farmer's truck	22%
Neighbor's truck	2%
Buyer's truck	5%
Railroads and other	3%
TOTAL	100%

Data developed in the course of the current investigation suggest that commercial truckers may be hauling an even greater proportion of West North Central slaughter cattle today than is indicated by the above figures, with producers' and buyers' trucks and the railroads continuing to lose ground as methods of shipment.

In an effort to recapture some of the lost traffic, some of the rail lines have recently taken positive steps to improve equipment and service for the handling of livestock. Technological progress in the design of rail cars and related equipment has been directed primarily toward increasing the payload per car and providing specialized equipment to speed service and reduce loss and damage of livestock in transit.

The most recent increases in payload capacity have involved the introduction of livestock cars which range in length from eighty to ninety feet and include provision for double decking of cattle and triple decking of hogs. The largest of the new cars are capable of transporting as many as 175 cattle, depending on size, or as many as 300 head of hogs, accommodating payloads of 75,000 to 100,000 pounds per car. This quadruples car payload.

The larger payload capacities of the individual cars and the utilization of the unit train concept to make possible the handling of volume multi-car shipments as a single unit from origin to destination offer the possibility of significant rate reductions on long-haul volume traffic.

Western railroads are currently experimenting with trailer-on-flatcar (TOFC or "piggy-back") service for livestock with some promise of success. A TOFC service for transporting hogs from Chicago to certain Atlantic coast points was first introduced in the early 1960's. However, the service was poorly patronized and was later discontinued.

The size limitations placed upon highway trailers by state and federal regulations offer a challenge to equipment designers to increase payload and reduce the transport cost per head of livestock within these constraints. The "possum belly" trailer, allowing double and triple decking of livestock in highway transport, is the truckers' current answer to the problem of maximizing payload and reducing unit cost within the legal size and weight limits. By reducing transport cost per head, this trucking equipment innovation has the potential of increasing the livestock procurement area for a given packer.

Meat Transportation

The refrigerated rail car was a primary factor in the development of the major meat packing centers of Chicago, St. Louis, Kansas City, Omaha, Sioux City and St. Paul. The existence of rail terminals and major livestock concentration points at these locations facilitated their developments as slaughter and meat packing centers when refrigerated transportation came into widespread use.

Increasing use of motor trucks and development of an all-weather farm-to-market road system in the 1920's and 1930's led to further changes in the industry. Motor transportation lessened dependence upon converging rail lines for shipment of livestock to traditional assembly points at the large terminal markets.

In time, mechanical refrigeration of both rail cars and truck trailers contributed to greater intermodal competition in the transport of fresh meat. In 1950 there were only six mechanically refrigerated cars in use. By the end

of 1965, there were 13,000 and the number was increasing at an accelerating rate.(143)

A 1953 pilot study of intercity truck transportation conducted by the United States Bureau of the Census, as reported by Ives[1/], indicated that in that year the tonnage of intercity shipments of meat and meat products was about equally divided between trucks and railroads. However, with an average length of haul for trucks of less than 100 miles, the rail movement on a ton-mile basis was approximately ten times as great as the movement of trucks. Also noteworthy was the finding that 81.5 percent of the tonnage of meat and meat products hauled by truck and 63 percent of the tom-miles were accounted for by private fleet vehicles owned and operated by packers, processors and wholesalers. Another 5.4 percent of the tonnage and 12.7 percent of the ton-miles involved the use of leased equipment.

By 1963, 70.8 percent of the fresh meat and 59.5 percent of the meat products were being hauled by truck.(148) Of the fresh meat shipments travelling distances of 1000 miles or more, 23.1 percent moved by truck. For-hire motor carriers accounted for a slightly higher percentage of total fresh meat ton-miles than the railroads in 1963.

Census data for 1963 indicated that meat shipments originating in the North Central states moved by rail in significantly greater volume than for the United States as a whole (44.5 percent as compared to 31.8 percent). The use of rail transport by North Central states shippers was reported as greater for all distances of shipment. Factors which have contributed to this condition are the higher concentration of railroad facilities in this area than in some other leading livestock production and slaughter areas; the large volume of product shipped from North Central slaughter areas to major markets; and the more highly developed rail transport service and more favorable rail rate structure for meat and meat products between North Central origin points and their major markets.

Private Carriage

In a recent investigation by the author, four of ten case study firms (beef slaughter plants) made extensive use of their own trucks in transportation of shipments to customers. Three of these firms handled processed and packaged meat products as well as hanging beef and delivered a substantial amount of their product direct to restaurants, institutions and retail outlets. The fourth was a "kill and chill" beef slaughter operation which shipped a high proportion of its output to distant markets.

The manager of one of the mixed-product firms stated that common carrier truckers have neither the flexibility nor the certificated authority to serve his accounts adequately. He has found it necessary to utilize his own truck fleet for 95 to 98 percent of his deliveries, relying upon common carriage for only a small portion of his long-haul shipments.

1/ (61) pp. 77-78.

Management personnel of other plants utilizing private truck fleets agreed that most regular-route common carrier trucking firms (as distinguished from irregular route carriers specializing in perishables transportation) are not geared to the needs of a meat packing operation. It was claimed that they cannot handle peddle runs of refrigerated product to retail outlets efficiently and that when shipments are for distant destinations, the common carriers often find it necessary to turn the loads over to cooperating carriers, thus creating problems of speed and quality of service.

One case study firm which ships 35 to 40 percent of its product via its own fleet of trucks was forced into this operation as a means of providing a more acceptable customer service when the management found it was taking five days to get a rail carload of hanging meat from the firm's midwestern plant to California. On experimental loads in its own trucks, it was found they could haul hanging meat direct to the Los Angeles market with a transit time of fifty-five hours, although at the beginning their maximum payloads were twenty-five thousand pounds. Transit times on this run have since been cut to forty hours by resorting to sleeper cab tractors, and the trailer loads have been increased to forty thousand pounds.

Operation of its own truck fleet has enabled this firm consistently to serve the California market when other midwestern packers have been unable to compete. The firm has been able to meet expenses, or better, on the return trip by hauling citrus or other produce from California to midwest markets.

The management of this firm emphasized its belief that next to availability of an adequate supply of livestock, the most important single factor influencing the location of its plant has been the availability of fast, reliable and flexible transport to primary markets, including the provision of company-owned trucks to satisfy customer requirements where this could not be accomplished satisfactorily through the use of common carriers.

Recent Transportation Developments

Among the more significant recent developments in the transportation of meat may be included the integration of truck and rail facilities in trailer-on-flatcar or "piggyback" service (hereafter referred to as TOFC service); the use of large containers, with self-contained refrigerating units, which can be loaded on rail cars, trucks, ships, and aircraft; and the shipment of high-value, perishable food products by air freight.

The availability of a coordinated rail-truck service has had special significance for North Central slaughter plants, and especially for those unable to avail themselves of the well-developed rail and trucking facilities of the established packing centers. Some of the newer plants at interior locations report use of TOFC service for as much as 65 to 80 percent of their shipments, and TOFC usage has increased rapidly with some of the older plants as well.

While this development has provided greater flexibility of service both at origin and at destination points, it has also introduced a whole new set of problems affecting the efficient management of the meat distribution function.

Some plants have encountered serious service deficiencies in their attempts to use TOFC. For example, one plant has been forced to shut down its slaughter operations for as much as a full working day because of failure of the rail line serving the plant to deliver promised trailers on schedule for loading. There have also been reports of persistent problems involving equipment specification and maintenance, factors which are especially important in the handling of a high-value perishable commodity such as fresh meat.

Despite these reported difficulties, there is indication that the railroads, and particularly those serving the heavy meat production areas, are steadily progressing in their ability to cope with the special problems of TOFC service and that this service will continue to grow as a new dimension in the meat-hauling capability of the railroads. Recent experience in beef slaughter plant location emphasizes that failure to provide for access to a TOFC loading ramp could be a seriously crippling omission in the choice of a new plant site.

Considerable activity is currently under way in further development and implementation of the container concept, especially in overseas and intercoastal shipping and in air cargo operations. Ocean-going container ships have been operated successfully for several years, notably in the Hawaiian, Alaskan and intercoastal trade. The shipping industry is building a new fleet of high-capacity ships designed from the keel up for efficient container operation. The United States Department of Agriculture and several transportation equipment manufacturers have done extensive experimentation in design and testing of refrigerated containers for meat and other perishables. These developments have engendered considerable interest in the possibilities for further expansion of overseas markets for American meat products, and particularly for beef.

This interest has continued to build as the meat packing industry has become more aware of the airlift capabilities and projected operating cost characteristics of the new generation of jumbo cargo jets now in the building and planning stages.

The relative cargo-carrying efficiency of the high-capacity jet aircraft is evident when ton-mile costs are compared with those for older types of cargo planes. Stanley Brewer reports that moving cargo in the DC-7 piston-engine plane and the turbo-prop powered CL-44 involves direct operating costs of 10.06 cents and 6.71 cents per ton-mile, respectively. Moving cargo in the DC-8F and B-707-320C jet powered aircraft, by contrast, costs 3.64 and 3.68 cents per ton-mile.(15) Immediate future prospects indicate a potential of about 2.75 cents direct operating costs per ton-mile with the Boeing 747 jumbo jet plane. Larger aircraft to follow will reduce even further the direct cost of flying cargo, provided they can be operated with economic load factors.

Brewer brings these costs into perspective by noting that to transport one ton 1,000 miles by motor carrier in the central region of the United States would cost $33.17. To carry the same amount in the DC-7 would cost $100; in the 707-320C, $36.80; and in the 747, about $27.50. He concludes that the new generation cargo jets are lowering the cost per ton-mile to the point of making the airlines competitive with motor carriers, both in the relatively short haul of 300 to 500 miles and in transcontinental hauls of 1,500 to 2,500 miles.2/

It is recognized, of course, that terminal, pickup and delivery, administrative and other indirect costs will be a crucial factor in the competition of the transportation modes. For example, more than 30 percent of jet airfreight rates are currently accounted for in the cost of ground handling of cargo. However, as the line-haul costs of the jet planes steadily decline toward a point at which they will be directly competitive with the motor carriers and with the perishable services of the railroads, the more innovative of the meat packers are taking an active interest in air freight potential for their industry. Some firms are currently experimenting with the breaking of beef carcasses to primal and retail cuts and airlifting of the fabricated fresh product to the more distant markets in the continental United States and to Puerto Rico, Hawaii and Europe. These experiments have involved individual containerized shipments of as much as 38,000 pounds.

In such innovative experiments, some industry circles see the beginnings of a trend toward increased breaking and fabrication of fresh beef at the slaughter plant, containerization of fresh meat shipments, and the use of air freight for servicing of distant markets. If such a trend should develop, it would have important implications for the meat packing industry and the selection of plant site locations for slaughtering operations.

Seeking to capitalize on the potential advantages of centralized packer fabrication and distribution of wholesale and retail cuts, one firm has built a modern high-volume meat fibricating facility at its headquarters plant. The other slaughter plants of this firm have been placed within a 150 mile radius of the headquarters location. This facilitates the movement of dressed carcasses from the satellite plants to the fabricating unit for further processing into wholesale and retail cuts. The firm has recently acquired a tract of land adjacent to a nearby regional airport where it will build a new plant for processing and freezing of portion-control cuts for the hotel, restaurant and institutional trade, utilizing product from the present slaughtering and breaking operations.

Livestock-Meat Rate Relationships

Since freight rates often are not directly related to the cost of hauling, the rate relationships established between livestock and meat may result in a somewhat arbitrary competitive advantage for certain slaughter plant locations as compared to others. The relative rate levels for slaughter cattle and dressed beef have therefore been the subject of much controversy through the years.

2/ (15) p. 31.

In their initial hostility to the successful development of the refrigerated rail car, the railroads originally established rates on fresh beef which were considered to be high relative to the rates assessed for movement of live cattle. Complaints by midwestern packers against this practice ultimately resulted in the Cooley award in 1884, which established that the livestock rate from Chicago to New York was to be pegged at about 57 percent of the fresh meat rate.3/

As rate adjustments have been made through the years in response to changing cost levels, growth of new markets, development of new livestock production areas and technological and institutional changes in meat packing and transportation, it has been impossible to preserve this 57 percent relationship of cattle to dressed beef rates. The following rail rates on cattle and meat products from the midwest to eastern and western markets reflect typical current relationships between cattle and dressed beef rates.4/

Item	Omaha to New York		Omaha to San Francisco	
	Load (Pounds)	Rate (per cwt.)	Load (Pounds)	Rate (per cwt.)
Cattle	25,000	$2.01	24,000	$2.27
Meat Products	30,000	$2.24	33,000	$2.61

It will be noted that in the rate comparisons above the rate on live cattle from Omaha to New York is equal to 90 percent of the Omaha to New York rate on meat products. The Omaha to San Francisco cattle rate represents 87 percent of the comparable rate for meat products.

Wage adjustements by the carriers, the upward thrust by the general price level and other factors have contributed to a general rising trend in freight rates since 1945. This trend is reflected in the following rail freight rate index figures for livestock and meat for the period 1945-64, as calculated from a 1947-49 base:(144)

3/ (61) p. 83.

4/ Data provided by Swift and Company, letter of July 10, 1968. Rates include Ex Parte 259-A adjustments, effective June 24, 1968.

Year	Livestock	Meat
1945	72	72
1946	75	71
1947	86	84
1948	103	103
1949	111	112
1950	113	115
1951	116	119
1952	127	127
1953	130	130
1954	130	130
1955	130	130
1956	136	135
1957	148	145
1958	154	135
1959	151	122
1960	149	123
1961	149	123
1962	148	122
1963	145	122
1964	145	122

It will be noted, however, that since 1958 there has been a significant drop in the rail rate indexes for both livestock and meat. Since 1957 meat rates have dropped more rapidly than those for livestock, thus distorting the relationship between the two rate levels. To the extent that transportation costs influence slaughter plant location, this trend toward reduction of meat rates relative to those for livestock would have the effect of encouraging slaughter operations in the heavier concentrations of livestock production in preference to transporting the livestock to slaughter locations nearer consumer markets.

Among the changes which have contributed to the reduction in rate levels noted above are increases in the size and capacity of rail cars and truck trailers, both for livestock and for meat; cost-saving and payload-increasing improvements in refrigeration equipment and methods; and the TOFC method of shipping loaded trailers or demountable containers on railroad flat cars. TOFC shipment often involves application of an incentive flat rate per load, offering the potential of major savings on volume shipments.

The need for careful analysis of the shipping alternatives in today's highly competitive markets is illustrated by the following cost comparison of three methods of shipping a load of meat from Omaha to New York, based upon rates in effect in July, 1968:5/

5/ Data provided by Swift and Company, letter of July 10, 1968. Rates include Ex Parte 259-A adjustments, effective June 24, 1968.

Method	Total Freight	Cost Per Cwt.
By Rail		
30,000 pounds minimum	$600	$2.00
Icing charges (summer)		.24
		$2.24
35,000 pounds minimum	644	1.84
Icing charges		.205
		2.045
45,000 pounds minimum	774	1.72
Mechanical refrigeration		.21
		1.93
Rate on weight in excess of 45,000 pounds		1.00
By Truck		
30,000 pounds minimum	732	2.44
Refrigeration included		
35,000 pounds minimum	791	2.26
Refrigeration included		
By Piggyback		
Plan 11¼ -- Plant to Destination Ramp		
35,000 pounds minimum	640.50	1.83
Refrigeration included		
Plus destination drayage charge	$75 to $125	

It should be noted that the method of shipping to be used may be influenced by factors other than cost, such as loading facilities at the plant, availability of suitable equipment at the time of movement, distribution requirements at destination and the special needs or preferences of customers.

IMPROVED COMMUNICATION -- THE KEY TO INCREASED EFFICIENCY AND COORDINATION IN BEEF MARKETING

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In an exchange economy, the price mechanism is charged with the task of effecting coordination between the various activities along the production-consumption continuum. Whether the price mechanism is capable of satisfactorily performing such a herculean task is debatable -- the fact that we are here discussing such issues might be interpreted as a negative vote. But discussing the success or failure of the price mechanism as a coordinating device is largely vacuous and sterile. Success -- and failure -- is relative and accordingly forever open to question. Consequently, I will skirt a discussion of the price mechanism as such and delve into the communicative dimension of the beef marketing system. More specifically, I will 1) discuss the communication system inherent to the beef marketing system, 2) delineate certain obstacles to effective communication processes and elaborate upon the conceptual relation between such obstacles and performance of the beef marketing system, and 3) raise questions concerning probable future developments in communication techniques and needs given to continually evolving and changing organizational structure of the beef marketing system.

The Process of Communication -- Breiefly[1/]

In any communication situation, certain components are essential, providing a necessary condition for communication[2/]. The source is the originator of the message of concern. The message is transmitted over some channel to a receiver, the entity for whom the message is intended. With just these three necessary components, communication is possible; typically, however, the process is much more complicated.

1/ Coverage of communication theory in any detail is not feasible in this paper. A simple conceptual framework will be presented as the basis for related developments, comments, and conclusions. An exhaustive treatment of communication theory was a necessary prerequisite to the author's earlier efforts at Michigan State University where a dissertation entitled "An Appraisal of the Information System in Beef Marketing" was completed. The study was conducted under a cooperative agreement between the University and the Marketing Economics Division, ERS, USDA during 1965-66 and was a contributing study to NCM-36. A limited number of preliminary copies of the dissertation are available. A bulletin, written from the dissertation, is now being processed and will be distributed soon through the USDA's Agricultural Economic Report series. Both of these references pay more detailed attention to delineation so a theory of communication and its application as a research perspective and a tool of analysis in beef marketing. The interested reader is encouraged to explore these and the references listed in the appendix to this paper if more detailed understanding of the communication process and the developing communication theory is desired.

2/ Communication might be defined as the "stimulation of a response from a receiver or receivers via a message as a transmitted cue."

Considering the components which have been identified, role behavior or performance is often complex. The source, for example, is affected by his operating environment and his perception of how he "fits" into that environment. Habits can develop, be reinforced, and perpetuated as the appropriate source of action even after the operating environment changes.

The source can possess varying levels of skills in reading, writing, speaking, and reasoning -- all "communication skills." These and other dimensions of the "source role" affect the source's performance.

There are many possible channels which can be used. The question of which is best is always relevant and depends upon such things as the type of message and the receiver. Among the possibilities are the audio, print, and pictorial channels -- or some combination of the three.

The receiver is also a complex entity. Learning theory is relevant in understanding why the receiver responds as he does to a specific stimulus (message). The operating environment, habit, and the dictates of group or social pressures all affect behavior of the receiver.

In sum, the communication system is complex even when discussed in its most limited form. The nature and impact of such complexities will be more apparent when the requisites of effective communication are discussed.

An added element of complexity emerges through the incorporation of an agent, an intermediary, who is often involved in the communication process. Such an agent acts in behalf of the receiver, screening and interpreting messages from the source and, on occasion, playing the role of source in providing information to the receiver. Performance of the agent is affected by the operating environment, the agent's perception of his role, by habit and by group or organizational pressures.

Though fully aware of the possible implications of such gross over-simplification, Figure 1 provides a schematic view of the communication process ad herein described. The additions to the basic components are the minimum required to suggest the continuity of flow and interaction which characterizes communication processes. Arrows show direction of influence. The feedback loops permit continuity, the possibility of adjustment and the reversal of role which can occur.

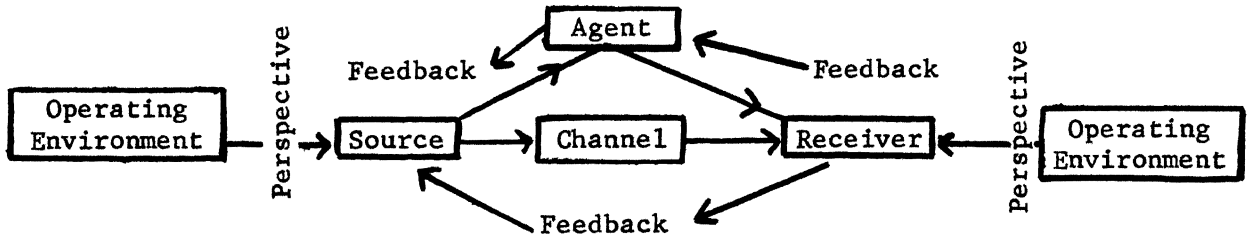

Figure 1. A Simplified Model of Communication

The Requisites of Effective Communication

The term "effective" requires consideration. As used here, effective communication refers to the ability to stimulate a desired response from selected receivers with the possible array of responses including 1) the promoting of coordinated procedure when a series of technically interrelated actions are involved, and 2) the motivating of change and adjustment when informational needs and/or the operating environment changes.3/

The requistes of effective communication are many. Brief consideration of the more important promotes understanding of the communication process and its application to marketing activities. Among the more important requisites are:

1. The source must understand the needs of his receiver(s). This understanding must be updated constantly since needs change.

2. Feedback loops must be present and functioning. In particular, the receiver must have a means of conveying his reactions to a message back to the source, or needed changes and adjustments on the part of the source will lag unnecessarily.

3. Each participant in a communication system must recognize the importance of the operating environment as a determinant of role conception and role performance. The successful source employs understanding of the receiver's operating environment to avoid conflicts with established norms, etc., and enhance the likelihood of a desired response.

4. Habitual action must be avoided. Neither habitual message construction nor habitual response to a message is conducive to effective communication. The byword of a system of action such as a communication system is adjustment to change and adjustment when needed is essential.

5. Each party to the communication process must recognize that symbols, not meanings, are transferred. The symbols comprise messages, but meanings are in the message users, not the messages per se. Thus, interpretation is important and the effective source will insure the desired interpretation by the receiver. Among the more commonly used techniques is that of redundancy (which refers to repetition, reiteration, or expanded message construction).

Overall, increased understanding of the nature and characteristics of communication processes will increase communicative effectiveness.

3/ This definition of effectiveness is largely void of economic content. Although communication theory considers the relationship between the likelihood of a favorable response and the amount of energy (or time) required in attaining that response, this does not insure that the costs involved do not exceed the value of the message. Thus, whenever actions are contemplated to "improve" communication processes, attention should also be given related returns and costs.

Application to the Beef Marketing System[4/]

Discussion of the communication process has proceeded at a conceptual and general level. Integration of the conceptual framework and practical application will be accomplished by delineating the more important obstacles to effective communication and discussing their possible impact on performance of the beef marketing system.

The System as a Whole

Certain characteristics of the beef marketing system which affect communicative effectiveness permeate the entire system. Other problem areas have impact more nearly at specific levels of activity.

Needed: A Broader Perspective

One of the more important barriers to coordinated and orderly activity in beef marketing is that of narrow perspective on the part of system participants. Implications of such limitations can be inferred (or hypothesized) by using the developed conceptual base.

Producers adopt a limited perspective toward price variability in the live cattle market. Little thought is given the entire spectrum of actual or potential implications. Cattle feeders feel they have to be gamblers and do not object to the packers' having to "bid up" the price of a light supply of cattle to fulfill operating requirements even though they admit losing money when the price is less favorable (usually when supply is heavy and the packer attempts to "average" the different markets or price levels.) There is little indication producers feel their position would be improved with increased supply and price stability in the live cattle market. Yet, considering the costs of packers of such variability and the nature of the competition among packers for live cattle, there is reason to believe that producer returns would improve with increased stability. More importantly, price variability tends to block the efforts of the system to direct producer activity into alignment with the needs of consumers. Price variability conceals price signals.

4/ The application involves identifying and briefly discussing obstacles to effective communication in beef marketing. In the study conducted at Michigan State, emphasis was placed on development of a basis for evaluation. Careful coverage of the received literature provided understanding for the communication process, communication theory, and supplemented understanding of beef marketing procedures and problems. Interviews were conducted with key personnel at the various levels of marketing activity. Feeders, packers, marketing agencies, and market news reporters were interviewed in Michigan, Illinois, Iowa, and Nebraska. Contact with Market News administrators in Washington, D. C., supplemented exposure to the USDA's market news activities. As will be discussed later in the paper, a formal questionnaire was sent to all the USDA market news offices considered important in reporting exchange activity in fed beef. Overall, the intent was one of developing detailed understanding of marketing activities, the perspective from which the activities are initiated, the informational needs and availabilities, etc., to provide a basis for inference.

Commission agencies have exhibited narrow perspectives. As the relative importance of the terminal market began to decline, the commission agent -- fearful of losing his means of survival -- fought the developing trend. Direct to the packer sales were denounced as "non-competitive", with the terminal (and later, auction) sale being the only truly competitive means of selling.5/ Only recently have the agencies begun to search for a productive role in a new and different organizational structure, one characterized by direct-to-the-packer sales on both a live and carcass evaluation basis.

The packing industry evidenced similar narrowness of perspective and resistence to change in refusing to adopt the USDA's dual grading system. The modified concept of grading incorporated a cutability scale into the standards and was theoretically a valuable innovation. However, packers were skeptical of the practical value of the new standards. Packers felt they would experience difficulty in merchandising their output based on the dual grading standards -- feeling they would be required to take discounts on carcasses grading 4 or 5 on the cutability scale without benefit of premiums on the carcasses grading 1 and 2. Yet, many of these same packers are prone to defend packer feeding by pointing to the need for stability in quality of cattle available in the open market. They also point to the problems encountered in finding an adequate supply of cattle which yield high cutability carcasses, the type in increasing demand by the large retail chains. A change which could well increase communicative effectiveness of the beef marketing system is only now being given a real test as use of yield grades, as offered by the USDA in 1965, is beginning to increase.

Selected System Attributes -- Obstacles to Communication

Inadequate Means of Product Description

Inadequate means of product description constitutes one of the more serious shortcomings of the system. Lack of precision in description contributes ambiguity to any message of which the current grade standards are a part.

To illustrate, let's look at the problem of product description as a potential cause of an undesirable dimension of two types of "coordination" which are developing. Decreasing volumes of live cattle on the terminal markets and the use of formula pricing in the wholesale beef market may be causing concern primarily because relatively unrefined descriptive standards are the rule rather than the exception.

If direct transactions are based on terminal quotations, it is important that both buyer and seller in the direct transaction know how the cattle they are trading compare to the cattle going through the terminal. Many feeders feel the cattle going direct are superior6/ to the general run of cattle on the terminal. Are the differences identified and specified in sufficient detail

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5/ Competitive sales, as the term is used, refers to sales characterized by physical proximity of a number of buyers, sellers, and the product to be exchanged.

6/ The superiority to which they refer is not necessarily in quality as evidenced by grade. Uniformity, volume, and more desirable (more valuable) carcasses are important reasons given by feeders and packers alike.

to permit the price mechanism to establish the "correct" price differential? If such specificity were present, relating the direct transaction to the terminal price quote would be a desirable type of coordination. This would mean that coordination across methods of selling would have been achieved. Any price differentials which develop would result from differences in value of the cattle to the packer and/or differences in marketing costs associated with the alternative modes of marketing. Such coordination is not in evidence, but its absence should not be attributed solely to the declining relative importance of the terminal market. Concern is more properly directed toward the inability of the current system of marketing, in conjunction with the currently used descriptive terminology, to insure that prices are never based on previous or concurrent prices for a "different" product.

The use of formula pricing in the wholesale beef market initiates a type of "coordination" which might also be undesirable. As more transactions are consummated with formula pricing, as fewer are negotiated, there is concern over the possible impact on the price level for carcass beef.

The importance of value differentials within a product line is again strikingly clear. That which is never identified cannot be priced and reported, and herein lies the problem. The "Yellow Sheet", the basis for most of the formula pricing, is most representative of the national carlot beef market. To provide a legitimate basis for exchange, reported prices must reflect any differentials which accrue because of volume (quantity) or quality. But many packers, especially the non-national packers, doubt whether such differentials <u>are</u> accurately reflected. Concern is voiced over the relevancy of quoted prices in negotiating transactions in less-than-carlot volumes or in markets away from Chicago. There is also concern over the (possibly excessive) relative weight given sales reported by brokers. Brokers often handle beef which is not suitable for sale on a close specification basis.

Reporting a price or price range in terms of weight and grade of the carcasses identifies none of the value variations within grade and weight groupings. If the quoted prices <u>are</u> based on transactions which are not representative of the conditions under which a significant proportion of the volume is sold, there <u>is</u> reason for concern. Again, there seems to be inadequate provision for identifying value differentials and pricing accordingly.

In a broad sense, of course, the challenge to the system is to convey proper incentive from the consumer back to the producer. The capacity to do so is threatened by the poor relation between federal grade standards and consumer's criteria of choice, the non-standardized refinement in the beef carcass market, and the limited ability of the packer to price the live animal in accordance with value-related characteristics specified by the retailer.

There is little conclusive evidence as to how the consumer chooses among cuts of beef. Both visual and eating preference tests indicate only a weak relation between preferences and the currently employed federal grade standards.

Retailers employ rigid specifications in seeking to buy a product consistent with developed interpretations of consumer desires. Techniques vary, but federal grade standards are often employed as a point of departure. The refinement which is employed in adding needed specifications is non-standardized, varying across packers and even across different buyers for a particular packer.

The packer plays a strategic role in overall system performance. The packer is one of the principals in each of the two important "markets" in the beef marketing system -- the wholesale or carcass beef market and the market for the live beef animal. If coordination is to be achieved, the packer must reflect the needs and desires of retailers to the producer.

Theoretically, federal grades permit the relating of live animal and carcass characteristics. However, packer buyers make significant errors in estimating grade and yield for the live animal. During periods of light supply, packers report their buyers tend to "cheat" on estimates of grade and yield while adhering to restrictions on price. The difficulties in transmitting a price signal through the live animal characteristics, becomes obvious.

Horizontal coordination, or coordination across participants at one level of activity, is precluded by the inability of current grade standards to classify the value-related characteristics which make beef a heterogeneous product.

The characteristics considered important at retail cannot be adequately valued when they are not identified and brought into pricing processes. Any descriptive completeness attained in the wholesale market through increased specification is missing in the live cattle market when the cattle are bought on a liveweight basis. The end result is perpetuation of an "average" price by grades. There is no assurance that variations around this average are consistent with variations in the value-related product characteristics not included in the grade standards. Thus, there is no assurance price signals will be effective as a message designed to invoke a response in the form of adjustments in production patterns and quality consistent with the needs and desires of consumers.

Variable Conditions of Exchange[7/]

Variable conditions of exchange become a problem, often related to grading and product description. Price may be biased as a message or incentive for action when uncertainty or lack of knowledge concerning weighing or grading conditions prevails.

7/ This area is given only introductory treatment here since an empirical investigation of the area is to be discussed later in the paper.

Price Variability and the Limited Role of Price

A fluctuating price conceals the inherent message concerning needed change -- if there is one. Time is employed in decoding a message, reaching a decision concerning the correct response, and beginning appropriate action. Because variability conceals the message, the decision maker may view the deviation between actual and desired performance as relatively large and deserving of immediate remedial action, once the "signal" is noted. The perception of the message is subject to error. Even if correct, the tendency is to over-respond -- to evolve a situation in which speculation has increased rather than decreased price fluctuations.

Sole dependence cannot be placed on price as a regulator and coordinator of marketing activity. Price can accomplish such a herculean task, if at all, only when a number of conditions are met. Two of the more important of these, complete and unambiguous product identification and complete understanding of the conditions of exchange, are not always met in the marketing of beef.

Price has a great deal of effect on the communicative capacity of the system. Price is an important conveyor of information, a message which is always noted. It should be clear by now, however, that price may convey the wrong message.

Absence of Provisions for Feedback

Feedback permits the decision maker to review the consequences of his decisions and make needed adjustments. There is at present no effective feedback loop from consumers to producers which would permit evaluation of productive efforts as culminated in the producer's selling decision.8/ Adjustments which occur are those motivated by transfer of price signals back through the system. Typically, a substantial time lag is involved as the producer seeks to determine the implications of observed price variations, indentify their cause, and relate them to level or type of production. At best, the "signal" has a hazardous course to run.

The Market News Service

Appraisal of the USDA's market news activities was an integral part of the 1966 study conducted at Michigan State University, the contributing study to NCM-36. A questionnaire was developed and sent to 27 different markets considered important in reporting trade activity for fed beef. Visits to several markets preceding development of the questionnaire, care in its

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8/ There is room for argument that none is needed. The producer, after all, judges the consequences of his decision on the basis of his experiences in the live cattle market. The purpose of feedback, however, is to facilitate adjustments. Accurate indications of occurrences at the consumer level would speed productive adjustments and eliminate the lag and possible distortion in the message when the indications must be filtered down through the system. The argument here is for feedback information to supplement, not replace, the price mechanism and make it more effective.

construction, followup visits to four of the more important "river markets", and a judicial and largely qualitative evaluation of the results provided what I consider to be a sound basis for evaluating the USDA's activities. Here, the more important conclusions will be summarized.9/

Operating Environment of the News Reporter

The news reporter's environment is perhaps best described by simply calling it inflexible. The organizational structure of the Service is a rigid one. Because standardization of procedure is necessary for inter-market comparisons, a great deal of emphasis is placed on "controlled" precedures and operations. Such inflexibility has repercussions, however, on the effectiveness with which the Service can function as an agent on behalf of information users (receivers). Several of such possible repercussions are discussed briefly below.

1. Seven of the 20 responding reporters noted they had not initiated contacts with their receivers within the past year to strengthen their understanding of receivers' needs. Of the 13 who noted such contacts were made, most indicated this was done as part of the annual revision of the mailing list.

2. Only eleven reporters indicated they had made any form of procedural adjustments within the past year at the directive of administrators. Most involved changing the time of reports, the way the report was written or other elements of "standardized procedure". Few involved any substantial change in content of the message.

3. Eight reporters had not passed suggestions from information users back to administrators within the past year. (Perhaps significantly 5 of these 8 were among the 9 reporters who indicated they had made no changes during the past year as the result of directives from administrators).

Overall, it would appear the Service is less flexible than would be desired. The operational provisions for feedback from reporter to the administrative decision maker appear inadequate.

Reporters Perception of Receivers

Eighteen of the 20 reporters considered the producer as the most important user of information. Often, other groups such as packers and dealers -- persons important in pricemaking and coordination of activity -- were given only minor importance.10/ Increasingly, we tend to stress the interrelations

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9/ The questionnaire is included as an appendix in the original dissertation.

10/ Newspapers and the wire services -- "conveyors" of information or channels -- were also selected as important users of disseminated messages. Apparently, the reporters should not have been expected to differentiate between users of information and what is but transmission media or channels of communication.

which tie all the various activities in beef marketing into a system. Consequently, the informational needs of all groups are important.

Less than one-half of the 20 reporters exhibited a tendency to view their receivers as using information in a probabilistic sense -- that is, employing subjective probabilities, perhaps in conjunction with ideas of expected variability based on previous experience, in choosing between markets or methods of marketing. A majority apparently felt the producer's primary aim is to maximize returns with little awareness of, or concern for, price and income instability.

Operational Procedure of the Reporter

Fifteen of the 20 reporters indicated they tried to report facts for the user to employ as he sees fit. However, 6 of the 15 failed to qualify this stand by also choosing an alternative which stressed the importance of being aware of the needs of receivers.

There was variability among the reporters in how they would handle an atypical group of cattle (perhaps horned cattle, cattle with grubby hides, etc.). Most would treat the group separately but only a few of the reporters indicated they would indicate why such cattle would bring a price different from "typical" cattle of similar weight, grade, and finish. The mass media, with demands for an even shorter report, exert an influence which is important here. The reporter would find it difficult to practice "redundancy" or otherwise insure consistent interpretation in the face of such demands by the mass media.

In another battery of questions, market "trends" were described on a first day - second day basis and the reporters asked to "call" the market for the second day. Conceding the difficulties with this type of question, there was little reason to doubt that reporters, when faced with the same developing market tendencies, will often describe or "call" the market differently. (Recall the point that meaning is in the message users, not the message or symbols themselves.)

In the carcass market, the following points might be made as applying both to the USDA's activities and the "Yellow Sheet":

1. The absence of any indication of the volume of trade opens the door for concern over how representative reports might be of the "true" demand-supply conditions.

2. Quoted price ranges are often broad with no indication as to why the range prevails; that is, the value differentials which prompt the price range are not identified.11/

11/ This problem is being partially offset by the increased use of yield grades. Around 20 percent of the beef which is quality graded by USDA is now being graded as well. When the yield grades are used in reporting exchange activity, a highly desirable type of descriptive refinement is injected into the system.

3. The lack of refinement in the descriptive terms employed contributes to the tendency for an "average" price to evolve, making the transmission of effective price signals (premiums and discounts) difficult.

The Chicago-orientation and the reputation as a report of the national carlot market for beef raises further doubts on the contributions the "Yellow Sheet" is making to effective communication.

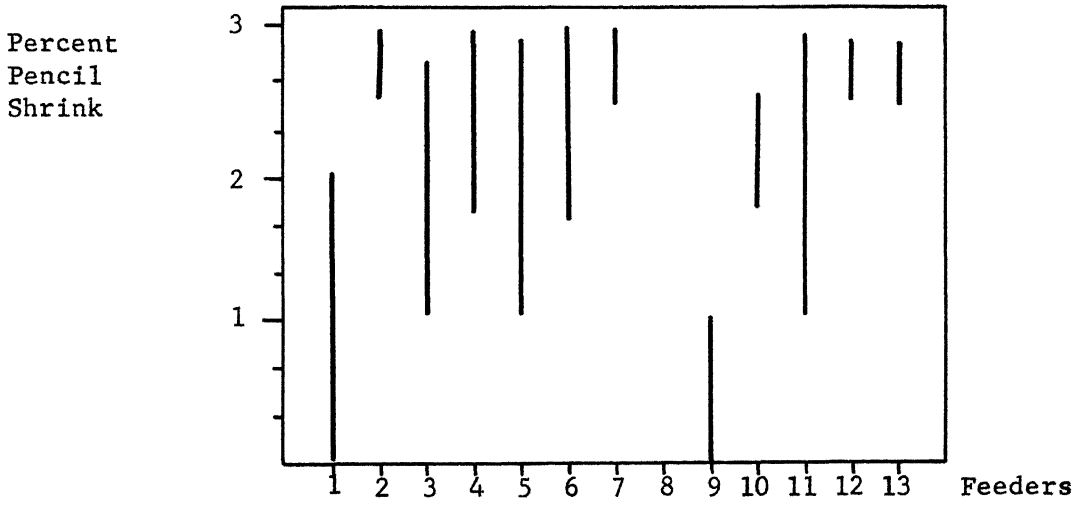
Variable Conditions of Exchange -- An Empirical Investigation

Earlier, variability in the conditions accompanying the exchange process was noted as an obstacle of effective communication. Variable weighing and grading practices associated with carcass grade and weight sales of beef have received much attention in the past few years. However, there has been little empirical evaluation of the economic implications of such variabilities. Here, we take a brief look at the variable weighing practices to which Oklahoma cattle feeders have been exposed and discuss the economic implications of that variability.

In late summer and earlier fall of 1967, 35 Oklahoma cattle feeders, each with a lot capacity in excess of 1,000 head, were interviewed in an effort to establish empirically the nature and magnitude of variable procedures in carcass grade and weight sales of slaughter beef.[12/] The feeders were divided into two groups in appraising the results of the interviews -- one group (comprised of 17 feeders) who sold at least one half of their cattle on a carcass grade and weight basis, a second group (comprised of 18 feeders) who sold more than 50 percent of their cattle on a liveweight basis.(138)

Thirteen of the 17 feeders in the first group responded when asked for estimates of the variation in pencil shrink they are required to take from one buyer or one transaction to another. The ranges reported by the feeders are sketched in Figure 2.[13/]

Figure 2. Ranges of Pencil Shrinks Requested of Oklahoma Cattle Feeders Selling on a Carcass Evaluation Basis



12/ Each of the 18 feeders had tried carcass grade and weight sales, however.

13/ Replies of the second group showed a slightly broader range of "shrinks". The difference between the two groups was not highly significant, however, and the second group will not be discussed here.

In Figure 3, the ranges (from Figure 2) are plotted in terms of deviations from 1.25 percent, assumed to be a representative figure for the majority of coolers for an overnight chill.[14/] The figures to the right of the ranges show the price implications of the deviations. The price implications are based on a hypothetical carcass priced at $40.00 per hundred-weight. To illustrate, consider a transaction with a pencil shrink of 2.25 percent. Here, the seller is receiving $39.60 per hundredweight for the actual chilled weight (if actual shrink is 1.25 percent) even though the transaction price is $40.00 per cwt. Price is biased upward by $.40 for each 1 percent pencil shrink exceeds actual shrink. If a pencil shrink of 3 percent is taken with actual shrink at 1.25 percent, the "bias" is $.70 per hundredweight.

Variable pencil shrinks thus appear to constitute a serious obstacle to effective communication in carcass grade and weight sales of slaughter beef. Briefly, the implications of these variabilities might be summarized as follows:[15/]

1. The comparison of alternative bids is cumbersome and complex. Not only price but the pencil shrink associated with that price must be considered.

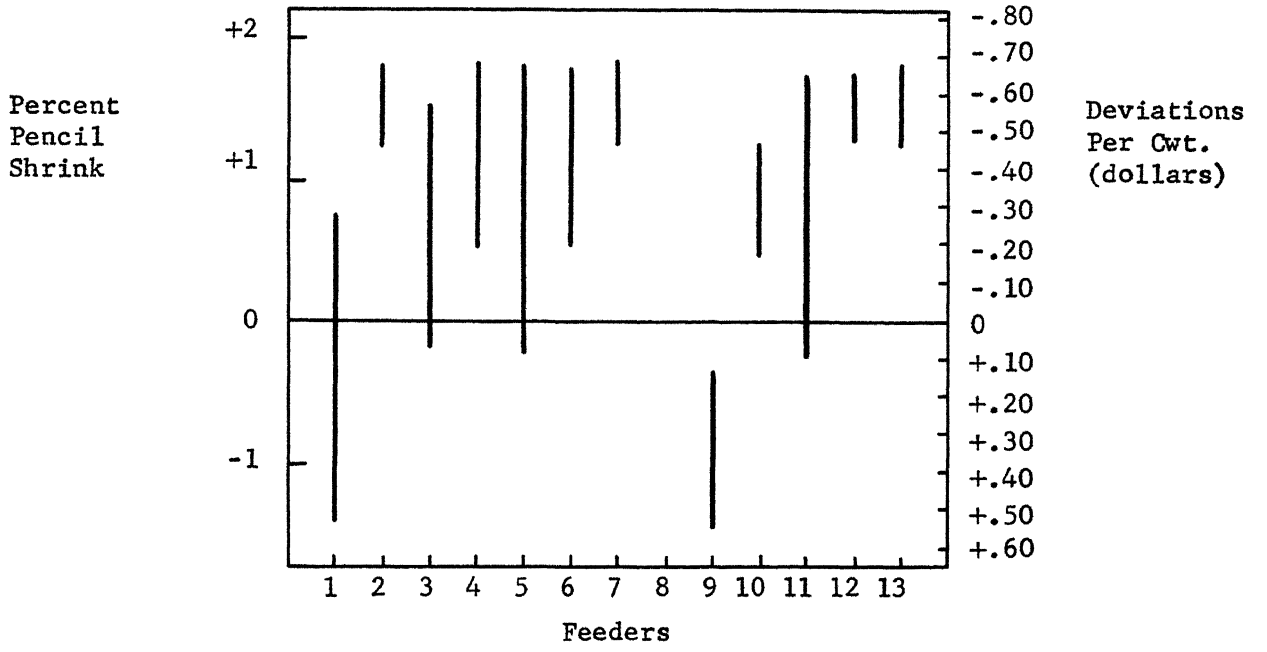
2. Price signals, which have potential of being an effective "message" are concealed by the varying pencil shrinks. Is the periodic price increase a premium, or is it a "bias" due to an excessive pencil shrink on those particular transactions?

3. Effective reporting of trade activity is more difficult, the resulting message less useful. Pencil shrinks associated with individual transactions cannot all be reported, meaning some standard must be assumed or the problem ignored. What part of the quoted price range is due to value differentials? What part due to price inflation (or deflation) by varying pencil shrinks?

14/ Actual shrink varies across coolers due to the condition of the cooler, control of humidity, etc. The USDA, in a survey to support the widely discussed regulations which are now in effect under the auspices of P & S found shrink varying from .5 to 1.5 percent for an overnight chill.

15/ Theoretically, the P & S regulations which went into effect in late spring of 1968 will eliminate this particular obstacle.

Figure 3. Pencil Shrinks as Deviations from 1.25 Percent



Which Way Now?

The implications of communication, new technology, procedural changes, theoretical tenets which over time will be empirically tested -- all these have immense and varied implications for the future. To keep the discussion manageable, and because I am incapable of doing justice to even these, I will discuss but two facets of the industry which will be materially affected by the level of communication effectiveness which is attained.

First, we look at the apparent relation between communication effectiveness and regulatory actions which affect the industry. We are all concerned, whatever our biases, with the extent to which unregulated exchange activity will survive.

P & S takes the stand that impediments to the workings of the price mechanism, impediments which arise from the actions of some industry group (or groups), justify concern and corrective action. Earlier, the problems associated with variable weighing practices were discussed. The industry failed to adjust when adjustment was in order. Any self-correcting mechanisms were inoperative and when the conditions persisted, the regulatory arm of P & S was extended.

If the industry continues to be characterized by groups who act as if they were independent of all other industry groups, continues to operate from a narrow and limited outlook which sees none of the increasingly apparent attributes of a system, and perpetuates action from a poorly informed position, poorly coordinated activity is the inevitable result. And poor coordination

along the vertical continuum will likely lead to "adjustment" of the price mechanism with the aim of improving that coordination. More attention to communication, more concern for effective communication, may mean the adjustments can come from within. Would increased efficiency and the avoidance of lags and delays be the result?

Second, consider the relation between communication and organizational structure of the industry. Whatever the stated reasons for vertical integration, change in both the flow of information and informational needs is one of the results which "settles out" when the transition is completed. When the openmarket exchange mechanism fails in its assigned task, that of effecting coordinated activity vertically along the producer-consumer continuum, other means will inevitably be tried. Is this not the basic reason for the much-discussed packer feeding of cattle? The packer must have a degree of consistency and stability in the supply of "raw material" available for their operations, both as to quantity and quality. The open market has failed to provide that consistency, that stability. Why? The reasons are many and varied, but those most obvious might be listed as follows:

1. The packer has been unable to accurately predict the supply of live cattle which will be available for purchase during any specific period of time.

2. The feeder has been unaware of, or indifferent to, the needs of the packer. The information from which the feeder has developed an operating perspective has not revealed to the feeder the needs of the packer or, for that matter, why the feeder should be concerned with those needs.

3. Too little emphasis has been placed on the interrelations between the various levels of activity. In particular system participants are poorly informed as to how changes at any one level of activity are diffused to other levels and what the implications are likely to be.

4. The prevailing research orientation is, and has been, characterized by minute and careful scrutiny of activity at one level. Data availability is one reason. But we are guilty of avoiding analysis of the interrelations, the inconsistencies, and the implications of limited perspectives on the part of the trade at least partly because this is the tougher, more demanding, road to travel.

Carry the process to the extreme -- what will be the informational needs, the channels of communication, in a structure comprised of largely vertically integrated concerns? Our role and the role of the public or private market news agency is not clear in such a setting. The process I visualize is one of substituting managerial control, perhaps by decree, for open-market forces in achieving coordination. Is this the way the industry will go? Are there alternatives? What are the implications of the various alternatives?

One thing is certain -- informational needs, and consequently, communication processes, will be different if a vertically integrated system develops. Stop and reflect upon the points I have tried to make -- points pivoting on problems associated with, or characteristics of, the exchange process between buyer and seller. In every case, at every junction of exchange, a message does not survive. What I have referred to as obstacles to effective communication processes are nothing more than procedural or organizational factors that hinder the transmission of a message which starts at the consumer level and is aimed in the direction of the producer. But what if these exchange points are eliminated via vertical integration?

In such a structure, the message has fewer obstacles to overcome. Much of the attention will be focused on 1) interpreting the revealed preferences of the consumer, 2) selection of cattle and/or carcasses which match those preferences. Is there new technology which will be brought to bear on this problem? There is presently a device in operation in Oklahoma which shows promise of predicting, with a high degree of accuracy, the amount of lean meat in the live animal by measuring the level of potassium content. Will we see the retail chains use such devices in selecting live animals to be slaughtered on a custom basis? If such develops, then informational needs might be limited to the following:

1. The consumption of beef by categories, the categories being based upon the capacity of the machine to distinquish lean meat content and/or other pertinent characteristics.

2. The total and regional availability of cattle by the categories referred to in (1).

3. Meaningful estimates of total demand and supply, again by categories. Alignment between aggregate demand and aggregate supply would remain critically important.

How far into the future must we look to see this or similar developments? I would argue the time span will be determined largely by the extent to which the prevailing exchange system moves toward increased coordination by eliminating prevailing obstacles to effective communication.

IMPLEMENTING IMPROVED PRICING ACCURACY FOR CATTLE AND BEEF

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Improved pricing accuracy for goods and services has been a subject of continuing debate throughout the history of organized marketing thought. The livestock-meat industry and its ability to accurately reflect the value of its products in price has contributed to the subject matter of this debate. Broadly speaking, pricing accuracy is an aspect of market performance which is assumed to reach its maximum, or at least optimum, levels under conditions of perfect competition. Much of the past debate has centered not upon pricing inaccuracy, the symptom, but on the nature of competitive activity, the underlying cause. Inasmuch as imperfections in the competitive environment give rise to imperfections in pricing and thus provide opportunities for pure profit, it is surprising that industry participants, generally, have taken differing positions in the debate: Industry leaders have tended to resist change and to protect competitive imperfection, while the more articulate and informed smaller participants frequently have pleaded for further "improvements" in the competitive condition with the expectation that these improvements would permit them to compete more effectively with dominant elements in the industry.

Government and academic circles have tended to take what they regard to be the positive side of the debate and have argued in behalf of improvements in pricing accuracy. The academic element in particular has tended to pursue this view with little sophistication concerning and thus little regard for the impact that certain proposals for pricing efficiency might have upon the operational efficiency of the system and, adequately hedged by the long-run view, felt often times that concerns for interim short-run operational inefficiencies could be dismissed as irrelevant. Industry spokesman have recognized this shortcoming in the academic argument and have erected on this blind side an array of counterpoints which plead the preservation of operational efficiency until the impact upon it of ivory-tower proposals for better pricing accuracy have been more carefully explored. Throughout these developments, farm groups have tended to echo the opinions of whatever group has most persuasively presented its case to them.

The entire period since World War II has been characterized by only two developments in this continuing debate. First, the past twenty years has witnessed an outpouring of research publications which have documented the pricing-accuracy benefits of this or that suggested change in marketing methods, but never with any thorough going exploration of marginal costs associated with these marginal returns (See Selected References). Second, developments of the past decade have given serious pause to adherents of pricing-accuracy-at-any-cost as new approaches in marketing thought and marketing research have recognized the unprecedented demands of technology and large-scale operation, and the devastating effect upon them of direct price competition as opposed to more subtle forms of competition on a non-price basis. Thus the new approach has more often explored the effects of

pricing accuracy as a cost item of living with operational efficiency while the earlier role had been more a matter of dismissing possible operational inefficiency as a cost to be lived with if we were to enjoy optimum pricing accuracy. This crack in the academic armour has permitted the debate between industry and academic elements to languish while both sides regroup. But government, meanwhile, has made some rather unheralded and inconspicuous moves which might result in a quantum-jump in pricing accuracy improvements, particularly for beef.

Permitting liberal allowance for the breadth of generalizations in these opening remarks, it is probably fair to say that this is the status of the continuing debate today.

There are perhaps three areas for review and consideration in a discussion of pricing accuracy for cattle and beef: 1) What are the sources of pricing inaccuracy, 2) what are the dimensions of pricing inaccuracy, 3) and what suggestions or prospects are there for improvements in pricing accuracy? Let us examine these briefly in that order.

Sources of Pricing Inaccuracy

Sources of pricing inaccuracy fall into two broad categories that might be called intentional and unintentional. By this I would mean intentional or unintentional departures from competitive activity. Intentional inaccuracy could thus be induced by fraud, collusion, monopolistic or monopsonistic structure or conduct, or by motives inspired by non-price competitive activity; but not by error, oversight or ignorance. Unintentional pricing inaccuracy could and does regularly occur by these latter means, however, through the shortcomings of a system which is encouraged to be as competitive as possible. But however competitive it may be, it is not perfect. Grades do not work perfectly; market news and marketing information in incomplete; consumers are not sophisticated buyers of finished products; management is subject to errors of judgment; producers are not agile in their response to market demands; weather has an unpredictable effect on product movement and supply response; religous beliefs, national holidays, ethnic background and a host of non-economic variables contribute to the character of demand.

The customer purchase price of the retail cuts from a beef carcass is of course the ultimate measure of value, and it may perhaps be argued that a large proportion of beef carcasses to reflect these values as a consequence of frequent retail cutout tests conducted by progressive large-volume grocery chains and affiliates. We might imagine that, at this terminal point of price determination, beef does enjoy a basis for more precise pricing than does pork.

But consider the opportunities for slippage that remain: Classic among these is the livestock buyers' obligation to guess what lies beneath the live animals hide and pay now for a peek in the grab-bag later. The implications of error in judgment on this count are so relevant to pricing accuracy (or the lack thereof) and have been so neatly set forth by others (31, pages 6-8; 95, pages 7-8) that I have repeated the illustration in an appendix to this paper. The obligation to judge carcass attributes in the

live animal, and to be committed to pay immediately on the basis of that judgment, is in itself so impossible a task that buyers in volume fall back upon a system of buying on averages with the consequence that perhaps not one of a thousand cattle was properly priced to the producer, but the average price of the thousand quite accurately reflects aggregate value to the packer. It is interesting to note that while buyers typically defend their ability as cattle judges, they defend with equal ardor their need to buy on averages as an expedient in large volume operations.1/ I think buyer skills are over-rated, and I think the notion that theirs is a complex undertaking requiring years of careful preparation is little more than popular fiction. Livestock buyers are a concession to institutionalized, traditional, archaic marketing beliefs and methods. I don't believe most buyers are capable of the cattle judging skill their reputation carries, I don't believe many - even most - buyers even try to exercise skill beyond buying for dressing percentage,2/ and I suspect that many a seasoned buyer with a practiced eye is befuddled by the complexities introduced to old habits by the new cutability grades introduced in June, 1965 (132). And I doubt that these old birds are likely to change very quickly. There are exceptions to these caustic remarks; there are buyers sprinkled here and there who have an awesome ability to judge cattle on both the basis of quality grade and cutability grade, but they are very few and even these are far from flawless (see 132, for example).

But aside from this classic problem of bridging the gap between carcass value and liveweight price in terms of grade, cutability, dressing percentage and related estimates, numerous other slippages occur with regularity. There is the matter of pencil shrink and the advantages it provides to those with bargaining dexterity. There is the matter of varying in-transit shrinkage and the diversity of its impact depending upon whether it is excretory or tissue shrinkage. There is risk of related losses in bruises, crippling, death, condemnations and pilferage, and the impossibility of measuring with any accuracy the source, cause or responsibility associated with the loss. There is cooler shrink, seldom measured but always accounted in determining packer costs. There is the variety of grades that are employed and the induced or accidental error of the graders. There are platform scales and rail scales throughout the marketing channel, the accuracy of which is prerequisite to the accuracy of prices paid and received. The list is not inclusive, but it serves to document the truth that there is room for pricing accuracy improvement.

The Dimensions of Pricing Inaccuracy

The role of marketing is something more than fulfilling a simple distributive process. It is perhaps not inaccurate to say that the physical distribution of goods and services from producer to consumer is the lesser

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1/ Most buyers deny the impossibility of the task, their principal claim to expertise being an ability to judge livestock with consistent accuracy. But research documents a substantially lower level of skill and exposes wide latitude for error in pricing accuracy. See for example 31, 53, 85, 95, 101, and 131.

2/ Large organizations often complain that their buyers purchase "paper cattle", i.e., cattle that look good on paper - company records - in terms of high dressing percentage and satisfactory grade, although the carcasses may otherwise show few desirable characteristics.

of its major functions, yet the obvious physical role typically is all that meets the eye of casual observers, such as farmers and many participants in the market system itself. By far the more critical role is that of determining consumer preference and conveying the message of consumer demands and preferences back to responsible suppliers by prices applied at successive levels of the marketing system - retail, wholesale, manufacturing, assembly, production. Hence the importance of pricing accuracy. Inaccurate prices put a lot of unnecessary noise in this communication system grossly confuse the message before it finally filters back to producers and livestock market operators. The example included in the appendix to this paper provides vivid testimony to the extent to which even the last spokesman for the marketing system, the livestock buyer, can disrupt the message at the final point of communication with the producer, the man responsible for initiating the response to changing consumer desires. Hence the importance of pricing accuracy. Inaccurate pricing permits the subsequent physical distribution of the wrong mix of goods and services.3/

Many a layman is skeptical of this pricing funtion of the marketing system, thinking the consumer much too unenlightened to convey a relevant message, and feeling therefore that consumers are as obliged to consume what is produced as producers are obliged to offer what consumers allegedly demand. I would concede the point that consumers, as an aggregation of individuals, probably are none too sophisticated and not very articulate. But I suggest that it is helpful to think of them as a mass, a mass so great that its inertia or its momentum is not much subject to the control of or manipulation by the marketing system. The retailer expends most of his energy scrutinizing this mass and devotes most of his time to improving the agility with which he responds to the pressures it generates. An analogy is helpful: One might think of the retailer in his relation to the consumer much as one thinks of the Congress relative to the voter. Each is capable of getting ideas of its own, but each is intensively sensitive to the wishes of its clientele except in those rare and isolated instances in each case where some retailer or some congressman enjoys a monopoly position in his own territory.

The dimensions of pricing inaccuracy for cattle and beef have been documented in research and other publications. What follows in only a partial review, and selected examples or illustrations are provided in the Appendix Tables.4/

A 1954 publication by the North Central Regional Livestock Marketing Research Committee(95) reported results of an examination of cattle buyer ability to estimate dressing percentage in a sample of 710 steers and heifers.

3/ It is not necessary to belabor the point with this audience. But perhaps the testimony of this group can reach the larger audience of participants in agricultural production and marketing through a published Proceedings.

4/ Some of the examples which follow have been presented in organized fashion elsewhere. For the reader who is particularly interested in examining much of the evidence concerning pricing inaccuracy, a helpful source would be (159), Chapter 27. That source consolidates the results of much of the other research included in the Selected References at the end of this paper.

Average error of estimate of dressing percentage was 1.5 percent. If one assumes, for example, a wholesale carcass price of 40¢, this, of course, amounts to a 60¢ per hundredweight error in live price paid for cattle subject to an error in judgment of this magnitude. Additionally, the study found that one-third of the animals were estimated with an error of 2.0 percent or more. In judging grade, these same buyers estimated correctly within one-third of a grade about two-thirds of the time, but erred by two-thirds of a grade or more in the remainder of the cases. The study recorded that, under prices then prevailing, an error of one-third of a grade would produce a liveweight price error of $1.03 per 100 pounds. The aggregate error of dressing percentage and grade would vary, depending upon whether the errors were additive or whether they cancelled each other. If a 1.5 percent error in dressing percentage cancelled the average error of one-third of a grade, an average price error of $0.28 would result, but if they were additive, the error would be $1.78.

A more recent Ohio study completed in 1966 (132) made a similar examination a buyer error in judging live cattle, and recorded an average error in dressing percentage of 1.4 percent in the purchase of 257 individual animals. About 71 percent of the cattle were placed in and priced on the basis of the correct grade. The study also examined buyer accuracy in estimating cutability grade. Of 209 animals purchased individually and upon which cutability grade estimates were obtained, 58 percent were judged correctly. Of 471 cattle purchased in 21 lots, wherein an averaging effect of estimates could occur, approximately 80 percent of the cattle were placed in the correct cutability grade.5/ Earlier studies also have documented the greater accuracy of buyer estimates when livestock were purchased in lots rather than individually (85, for example).

The Ohio study also found that experience or desire biases the buyer in his judgment of what he sees in the live animal. If his experience dictates that most cattle dress between 59 and 61 percent, he tends to judge a higher percentage of cattle to fall within this range than actually occurs (61.3 versus 40.5 percent). If it is his intention to purchase Choice cattle, he will judge a higher proportion of his purchases to be Choice than will be confirmed by an examination of carcasses. Moreover, the buyer's knowledge of his own limitations as a judge, and his recognition of the great range of possibilities that will confront him, causes him to be conservative in his judgments. Thus, the buyer not only places too many cattle in a favored category, whether it be dressing percentage, quality grade or cutability grade, but he also will err in judgment more frequently on the conservative than on the liberal side.

Two other sources of pricing error identified in the Ohio study were in the disparity between the conventional packer assumption of 3.0 percent cooler

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5/ This may overstate buyer capacity to estimate cutability grade; however, inasmuch as these purchases represented fairly uniform groups of feedlot cattle which would be unlikely to cause the buyer to consider the complete range of cutability grades. For example, most of his concerns might center around the proportion of cattle in cutability grades 2 versus 3, or 3 versus 4, rather than the entire range from 1 to 5.

shrinker shrink, and in differences between buyer (plant owner) estimates of expected carcass cost on the rail and actual carcass cost. During eight weekly collection periods from January to November, 1966, actual cooler shrinkage was recorded on 413 carcasses. Average shrinkage was 1.6 percent. Shrinkage ranged from 1.3 percent for a period of one day in the cooler to 1.8 percent during an eight-day tenure in the cooler. An assumption of 2.0 percent cooler shrink would appear to be a more appropriate standard than 3.0 percent. Partly as a result of this conservatism concerning cooler shrink, estimates of rail cost also proved to be high. Of 395 carcasses in 16 lots, lot estimates of rail cost were high in 13 lots, the error ranging from 2¢ per hundredweight to $1.96 per hundredweight.

A final source of error examined in the Ohio study was that associated with wholesale sales of carcass beef out of packer coolers by pricing without regard to cutability grade. Establishing a basis for comparison with Yellow Sheet prices at a cutability grade of 2.5, prices were computed at current prices for carcasses of other cutability grades.6/ These adjusted prices were compared to the prices at which carcasses were actually sold to packer customers. Approximately 15 percent of the carcasses were sold at the price indicated by this adjustment. Sixty-six percent were overpriced, and 19 percent were sold too cheaply.

Appendix Tables summarize sources of pricing error identified in the Ohio study. Table 4 illustrates several sources of error for 11 selected cattle of approximately equal liveweight and carcass weight. One may notice that all sources of error which are illustrated could be eliminated by deferred payment system under which cattle would be purchased on carcass weight and grade, with cutability grade incorporated as an integral rather than an auxiliary aspect of Federal quality grades.

Pricing Accuracy Problems for Beef Versus Pork

There are several important differences in the circumstances surrounding the product and its marketing environment that make the problem of pricing improvements for beef significantly different than the problem for pork. It should be useful to examine some of these differences.

1) First, until the implementation of cutability grades for beef, the grading systems for beef and for pork were designed to meet two different immediate objectives, although both were addressed to the general problem of more efficient marketing (pricing accuracy being a major aspect) through better market communication. The beef grade was a quality grade -- a palatability grade -- which was oriented toward the final consumer and consumer preference and acceptance. The pork grades were cutability grades which identified variations in the value of carcasses due to different proportions and weights

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6/ By employing carcass yield constants found in the "Beef Carcass Yield Grade Finder", C & MS, USDA, June 1, 1965

of primal cuts, but without direct relationship to pork quality or consumer acceptance. In a word, the beef grade was a quality grade and the pork grade was a quantity grade. More recently, beef cutability grades have been added as an auxiliary to the beef grading system and this addition constitutes a grading objective and method which is parallel to that of the pork grades. Beef now has a quality grade and a quantity grade. Pork has only a quantity grade.

2) Second, the beef grades, both quality and quantity, are meaningful throughout a broad spectrum of the marketing channel, clear to the consumer for the quality grade and clear to the retail butcher for the quantity grade. The pork grades have their principal relevance to the pork packer and seldom extend with any meaning whatever any deeper into the marketing system. There are reasons for this. First, of course, is the fact that beef quality grades were intended to say something to consumers, and by a process of absorption, prodded by interim periods of duress when grading was mandatory, they have become somewhat institutionalized into the marketing system. If consumers, perhaps may still not be knowledgeable, retailers are, and their insistence upon federal grades has become fairly commonplace. Second, by contrast, pork grades have not been readily accepted by the trade, each participant seeming still to have his own notions about quality-quantity and the correct system of grading to reflect this. This in itself occurs for a variety of reasons, among them (a) the fact that quality is not directly graded by government standards and the grades have little consumer relevance, (b) quality standards applied by industry are really quantity standards inasmuch as quality means amount rather than some direct observations about taste, texture, firmness, etc., and (c) most important, the pork carcass loses its identity in the marketing process through (1) processing and (2) breaking at the packer level, neither of which is true to any significant extent for beef. This latter is important for two reasons: First (a) control in fat-lean ratios, as a measure of quantity-quality, occurs quite close to the end of the marketing process for beef, it being mostly the trimming function of the retail butcher, whereas this function, plus processing, occurs almost as close to the other end of the marketing system in the case of hogs, and second, (b) the multi-market distribution of the hog carcass as opposed to the single-market destination of the beef carcass negates the opportunity to reflect differential values back to sellers of the complete carcass or to those in turn responsible for the production of the animal producing the carcass.

3) Third, all this identifies a third significant difference which relates back in part to this previous comment, and that is the matter of bridging the identity gap between the live animal and the carcass. This is one of the differences in which hogs and pork have a distinct advantage. Hogs can quite successfully be tattooed and identity can be maintained with no difficulty, but there is no equally satisfactory method for cattle. If an identification technique could be developed which could be applied to the live animal and exposed on the carcass at slaughter, as is possible with tattoo procedures for hogs, cattle and beef could much more readily reflect improved pricing accuracy than could hogs.

4) Fourth, finally, a two-edged blade of difference: The beef carcass in the retail store much more closely resembles the final effort of the original farmer-owner than does the multitude of packinghouse products that at one time had some distinct or obscure origin in the hog the farmer sold. The beef carcass is rather a simple commodity and its pricing is fairly straightforward. The pork product is neither simple nor fittingly called a commodity, for the mysteries and complexities of processing have elevated it above commodity status and permitted brand name distinctions to be applied. Pricing is a matter of putting the dollar not only on the pig but on the secrets of the packer's arcane skills. Or so it is intended.

Opportunities for Improved Pricing Accuracy

We might begin by recognizing three things about prospects for improved pricing accuracy: 1) First, from the foregoing, we may observe that neither the problem of pricing accuracy nor the obstacles to improving it appear to be as severe for beef as for pork (aside from the new and real possibility that new developments in meat wholesaling and retailing, such as meat programs and formula pricing may radically disrupt what we presently perceive to be the conventional basis from which further improvements in pricing may be made.[7/] 2) Second, the payment for livestock on an immediate and liveweight basis constitutes a principal source of pricing inaccuracy, and continues to exist only as a compromise between what is best and what is popular. The entire procedure of livestock judging, livestock grading and immediate payment exists only as a concession to tradition and as a paliative to those who fear the unknown effects of changes they neither understand nor accept the wisdom of. 3) Third, therefore, the success of implementing improved pricing accuracy (the greatest gains for which are likely to be derived from deferred payment systems with prices paid on a carcass weight and grade basis) will depend to a great extent on the adequacy and workability of an extensive set of rules, guarantees, assurances and reassurances which serve to alleviate the doubts and worries of the meek and limit the opportunities for the bold. This means that rules must be applied to those several areas of slippage where pricing inaccuracy may occur, several of which have been summarized on an earlier page.

An aversion to rules is of course a principal impediment to progress, but the rules have begun to appear. I think the prospects for acceptance of new rules of behavior in livestock and meat marketing are quite good. The principal reason for this is the emerging (or emerged) dominance of retailing in the marketing system and the necessity for greater compliance to retailer-imposed rules by the rest of the marketing framework. This has been manifested in the interest of packers in seeking new cost-savings in livestock purchases, among them the undertaking of direct purchases, by-passing a system of terminal and country markets which no longer perform the assembly function as satisfactorily as in earlier times(131). Opportunities for increased direct

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7/ This qualifying remark may hide a whole cast of demons, however. The conventional methods of marketing and pricing which is underpinned by a system of free market prices may already be undergoing a basic transformation toward a system of managed prices. See (131) for example, or the presentation by W. F. Williams, in this proceedings.

marketing also have been improved by increased sales and specialization among producers, as evidenced by the emergence of commercial feeding operations in the past decade (See the paper by McCoy, J. H., in this Proceedings, for example). I suspect that increased use of carcass weight and grade payment will be a natural and parallel development accompanying the increase in direct marketing that we are presently witnessing. I suspect the time has arrived when new rules will be requested by the industry as much as, in the past, they have been resisted.

What, therefore, are some of the prospects for improved pricing accuracy in cattle and beef that we might anticipate in the next several years?

1) First, I think we may see livestock market operators begin to take some steps to further improve the compromise plan of buying and paying for cattle on a liveweight basis. The Independent Livestock Marketing Association, representing many of the independent country markets in Ohio and including some membership in other midwestern states, presently is developing a plan whereby livestock sold through auctions may be bid upon either on the conventional liveweight basis or on the basis of carcass weight and grade, as the consignor wishes and instructs. Purchases made on carcass weight and grade require a base payment, to which the final payment is added after slaughter. A pilot attempt involving the cooperation of one auction and four Ohio packers will begin in January, 1969. While this kind of program may result in improved pricing accuracy it would seem to be lacking in any particular incentive to inspire buyers to employ the method. The total procurement procedure remains the same as far as packers are concerned and thus provides no opportunity for cost saving. Procurement costs may increase due to added problems of maintaining owner identity through the slaughter and payment process. The brighest aspect of this program, however, is the progressive attitude it represents on the part of market operators and their trade association. Moreover, it may represent a most appropriate technique for introducing packers, market operators, and particularly producers, to the mysteries of deferred payment and carcass weight and grade pricing, matters which seem to have frightened many potential participants for so long.

2) Second, the Packers and Stockyards Administration has concerned itself with establishing rules or guidelines for deferred carcass weight and grade payment and articulated some concerns as early as 1962 (159,page 700). Specific guidelines have since been published (146, 147). These guidelines are employed in the forthcoming Ohio pilot program. I have wondered whether we might not see further refinements in these and related federal standards surrounding both direct marketing and carcass weight and grade pricing. I believe there are several interesting possibilities which we might contemplate:

(a) First, and perhaps most interesting, I have been intrigued by the implications of recent changes in Federal grades for carcass beef, when cutability grades were officially introduced into the carcass grading structure which may or may not accompany the customary quality grade, it interests me greatly that the carcass must now be ribbed to permit the grader to more accurately determine the quality grade. This procedure of course exposes that formerly hidden aspect of the carcass upon which most of the cutability grade is determined. What excites me is the prospect that someday a deadline may be imposed beyond which the cutability grade is an integral part of the grading procedure. This could have a dramatic impact on pricing accuracy in

wholesale meat trade. Although the entire grading procedure might remain voluntary, it is unlikely that many large packers would retreat from federal grading because the pressure for and insistence upon federal grades by retailers is already too firmly established in the marketing system. Federal grading would remain established. You may recall that at the time official grades for hogs were presented to the marketing public that the typical hog market operator was unwilling to sort hogs and pay differential prices for fear of the response that might be forthcoming from his competitors. His typical comment was "If everybody would start at the same time, everything would be OK, but I don't want to be the first to try it." His point was that, given the market price for No. 2 hogs, and differential prices above and below this for No. 1 and No. 3, much of the premium for No. 1 would come from a discounted price for No. 3. But unless his competition joined with him in differential pricing, he would be confronted by the disadvantageous fact that farmers could sort their own hogs before taking them to market, and the erstwhile innovator would find himself with plenty of No. 1 and No. 2 hogs, while the No. 3 hogs went down the road to the competitor who would not discount them thus making extremely difficult the innovators much advertised commitment to pay a premium for No. 1 hogs. The result was that no one was willing to dock No. 3 hogs though many, if not most, markets struggled to pay some niggardly premium for No. 1's and, in their efforts to look good, soon came up with a variety of house grades and an array of techniques by which they could generate some sort of an apparent premium on other bases.

Precisely the same difficulty confronts packers today in selling carcass beef at differential prices based on cutability grade. Buyers willingly purchase discounted 4's and 5's from the innovator, but go to another, less enterprising, packer who is not charging a premium for the more desirable 1's and 2's. The innovator develops other techniques, such as improving upon the old standard practice of "streamlining" sides for his trade. Conventionally, the price premium for a streamlined side just about makes up for the weight loss realized from streamlining. But the sharp packer has discovered that it pays to streamline the most desirable sides, because the conventional premium price per pound, which amounts to about 25 percent, far more than makes up for the weight loss of trimming a No. 1 or high No. 2 side, in which the weight loss is only about 15 percent.

The impact of a federal pronouncement such as I have suggested is thus obvious, and its effect would indeed be dramatic.

(b) Secondly, I have wondered whether we might not expect to see a further refinement in P & S guidelines for direct buying and carcass weight and grade payment, and this also could have a dramatic impact, particularly if the first development, above, should occur. This would be the requirement that packers who wished to purchase on the basis of carcass weight and grade be required to employ Federal grades, on the grounds that Federal grades are standardized whereas house grades vary widely and thus cannot be uniformly understood or compared. Again, the use of Federal grades would remain voluntary and packers would remain free to reject them, although it would mean they would not be able to purchase on the basis of carcass weight and grade.

(c) Third, with or without the above developments, I would think that increased emphasis by the Federal Market News Service is likely to be devoted to increased coverage of and price reporting on the basis of wholesale meat prices. Producer understanding of prices today is confined largely to liveweight price reporting, although increasing numbers of them are confronted with the use of wholesale prices employed by packers as more and more sales are undertaken on the basis of carcass weight and grade. The Market News Service may indeed find that switching greater emphasis to wholesale reporting is at least a partial answer to another dilemma; that being the decreasing viability of terminal market prices which have remained a mainstay in the reporting methods that are employed. As it becomes increasingly difficult -- even impossible -- to present viable market news in the face of terminal decline and even country market stagnation as direct marketing increases, the use of packers as the touchstone or tap into the information grapevine may become an increasing attractive possibility.

(3) We narrow down to final bottleneck: Identification of the beef carcass with the original owner of the live animal remains unsatisfactory. All methods presently enjoying widespread use -- auction numbers, eartags, etc., do not directly identify the carcass -- only the live animal. Whereas pork producers might enjoy such possibilities as individually registered tattoo numbers, as cattle brands presently are registered, no such possibility is known to me which would satisfactorily and indelibly identify a cattle carcass. To say that the packer could be careful to transfer an eartag or some other live animal device onto the cattle carcass at slaughter does not seem to me to be a proposition that producers would accept with much enthusiasm. But it does seem to me that the problem of identification is not impossible and that it is, indeed, a small problem to be overcome. For example, a redefinition of MID responsibilities on killing floors could include responsibility for overseeing the transfer of identification from cattle to carcass.

I am optimistic, therefore, that we can expect marked improvements in pricing accuracy for beef in the coming decade.

APPENDIX 1

"The buyer for a packer ordinarily operates under instructions to buy different grades of cattle on a dressed weight or carcass basis. The prices are based on the expected wholesale carcass prices, plus a credit for the value of the by-products, minus the costs of buying, assembling, slaughtering, processing, and selling the products. Assume that a buyer is bidding on a lot of 20 steers, 16 of which he estimates will produce Choice carcasses and the other four Good carcasses. He has been instructed to bid up to $45 per 100 pounds carcass weight for Choice and up to $40 per 100 pounds for Good carcasses. On the basis of his estimated grades, assuming that the average weight of the Good carcasses is the same as that of the Choice carcasses, the dressed cost for the lot would be $44 -- that is,

$$\frac{(\$45 \times 16) + (\$40 \times 4)}{20}$$

per hundred pounds. If all the steers were estimated to dress 60 percent, he could offer up to $27 ($45 x .60) per 100 pounds liveweight for the Choice steers and $24 ($40 x .60) per 100 pounds for the Good steers."

In the example at hand, the buyer would have paid $26.40 ($44 x .60). "Now assume that the 20 steers were bought at $26.40 and, after slaughtering, it was found that ten carcasses graded Choice and ten graded Good, and that the lot yielded 59 percent, instead of 60 percent. On this basis, the buyer should have bought the lot at $42.50 per 100 pounds of carcass,

$$\frac{(\$45 \times 10) + (\$40 \times 10)}{20}$$

or at a live price of $25.07 ($42.50 x .59) per 100 pounds of live weight. Thus, the producer would be overpaid $1.33 per 100 pounds of liveweight because the buyer overestimated both the yield and the grade. If all the carcasses had graded Choice and the yield of the lot had been 61 percent, the producer should have been paid $27.45 per 100 pounds of live weight. In this case, the producer would have been underpaid by $1.05 per hundredweight because the buyer underestimated both the grade and the yield. If the lot contains more than one grade and the average yields differ between the grades, the problem is more complicated."

1/ See 5, pages 6-8; or 12, pages 7-8; or 23, page 682

Appendix Table 1: Cattle Buyer Accuracy in estimating dressing percentage of cattle purchased individual, 1954 and 1966

Estimated	1954 Regional Study		1966 Ohio Study	
	No. of Head	Percent	No. of Head	Percent
Estimated too high	234	33.0	95	37.0
Estimated correctly	73	10.3	25	9.7
Estimated too low	403	56.7	137	53.3
TOTAL	710	100.0	257	100.0

Appendix Table 2: Actual and estimated carcass grade for 235 fed cattle classified by U. S. carcass grades, 1966

Grade	Carcass Grade Buyer Estimates		Carcass Grade Federal Grader	
	Number	Percent	Number	Percent
Prime	5	2.13	17	7.24
Choice	192	81.70	163	69.36
Good	38	16.17	55	23.40
TOTAL	235	100.00	235	100.00

Appendix Table 3: Estimated and measured cutability grade for 209 cattle, 1966

Cutability Grade	Cutability Grade Live Estimates		Cutability Grade Carcass Measurement	
	Number	Percent	Number	Percent
1	0	0	7	3.35
2	48	22.97	74	33.89
3	159	76.08	106	50.72
4	2	.96	21	10.05
5	0	0	1	.48
TOTAL	209	100.00	209	100.00

a/ North Central Regional Publication 53, October, 1954

Appendix Table 4: Estimated and actual liveweight and carcass characteristics for eleven selected cattle, with actual and adjusted selling prices, Ohio pricing accuracy study, 1966

Live Price	Live Weight	Estimated Grade	Dressing Percentage		Actual Chilled Dress	Carcass Weight	
			Hot Minus 3%			Hot Minus 3%	Chilled
			Estimated	Actual			
27.00	1030	C-3	59.5	57.9	59.6	596	614
26.50	1035	C-3	59.0	59.8	61.0	619	638
26.10	1015	C-3	59.0	60.4	61.5	613	632
27.80	1000	C-3	60.5	60.0	60.8	600	619
27.70	1015	C-3	60.5	60.3	61.3	612	631
28.90	1010	P-3	59.0	60.1	59.2	607	626
27.40	1025	C-2	61.0	61.6	63.4	631	650
25.75	955	C-3	60.0	61.5	62.8	587	605
25.90	1045	C-3	62.5	62.8	64.2	656	676
26.30	1000	C-3	62.0	63.1	64.2	631	650
25.80	1010	C-2	63.0	60.7	62.6	613	632

Appendix Table 4: (continued)

Carcass Grade	Sale Price[a] Actual	Sale Price[a] Adjusted	Adjusted Live Price	Live Price Error Per Cwt.	Live Price Error Per Head
C-3.1	46.0	44.7	26.64	+$0.36	+$3.70
G-2.5	45.0	45.0	27.45	- 0.95	- 9.83
P-1.5	46.0	47.9	29.46	- 3.36	-34.10
P-3.3	46.0	44.3	26.93	+ 0.87	+ 8.70
C-2.4	46.0	44.1	27.03	+ 0.67	+ 6.80
C-5.0	47.0	42.6	25.22	+ 3.78	+38.18
C-2.6	48.0	47.8	30.31	- 2.91	-29.83
C-3.8	44.5	41.9	26.31	- 0.56	- 5.35
G-3.5	44.0	42.1	27.03	- 1.13	-11.81
C-1.6	44.0	45.8	29.40	- 3.10	-31.00
G-2.1	44.0	44.8	28.04	- 2.24	-22.62

[a]Some pricing error remains inasmuch as the actual sale price was accepted as the correct, current price for a carcass of indicated quality, grade, and cutability grade of 2.5. Thus, the effect of bargaining in reaching the actual sale price (but without regard to cutability grade) is accepted as a normal feature of such transactions. Also, chilled dressing percentage has been employed although hot minus 3% is customary.

IMPLEMENTING IMPROVED PRICING ACCURACY-HOGS AND PORK

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Research activity in hog and pork marketing has progressed well down the path of least resistance. It has generally avoided that no-man's-land of economic organization and resulting performance and thereby avoided the considerable criticism offered those working in this area.

Livestock marketing economists have faithfully directed their activity towards describing changes in the movement of livestock from production to consumption and the changing institutional structure involved. Livestock marketing research activity continues its concern with the efficiency and costs of operating marketing facilities. Though considerable resources have been directed towards various aspects of the pricing problem, these efforts have generally not been sufficiently comprehensive.1/ Results have been fragmentary and have not generally been integrated to form a cohesive body of knowledge useful in solving the primary problems of pricing efficiency. Though the lack of a complete theory of imperfect competition may be a partial explanation of our less than optimum performance, it can also be said that the available theory has not been fully exploited.

It is hoped that this paper will stimulate sufficient interest and raise sufficient controversy so as to correct the current imbalance to research activity.

Change in Methods of Marketing Hogs. Since World War I, rapidly changing technology has had a profound effect on the marketing system for hogs and pork in the United States. Technological change has influenced both the physical movement and institutional arrangement for producing and marketing hogs and has spawned the decentralized system.

Changes in the technology of marketing and production has tended to complement one another. Decentralization, facilitated by the adoption of motor truck transportation and the development of refrigeration, was also facilitated by a rapidly changing agricultural production structure characterized by increases in specialization and size of farm unit.

Other pressures for change in the production-marketing complex are eminated from the retail sector. From a physical standpoint, the modern self-service, high-volume, supermarket demands a scheduled flow of uniform products. Most retailers appear to prefer relative stability of prices. In order to obtain this stability, retailers desire to control the quality and quantity of products marketed and to balance this with current demand. These desires are, in large part, being manifested through attempts to coordinate production-marketing activities.

1/ Insight into the failure of marketing research performance is offered by (161).

Technological change, while influencing the physical movement of the product and the institutional arrangement of the system, has also affected the economic organization of the system and the relative importance of various methods of pricing. With decentralization came a decline in the concentration of livestock buyers and sellers and a consequent problem in gathering and disseminating market information. These changes may well have affected the nature of competition at the primary market level.

Changing Importance of Pricing Methods. Changing technology and structure has altered the relative importance of traditional methods of price negotiation: 1) The traditional "Private Treaty" (buyer vs. seller) method of price determination such as exists when hogs are sold to dealers, order buyers or packers, has changed as a result of the decline in terminal market sales and growth of country selling. At decentralized points, the relative bargaining position of the parties to the negotiation may well have changed as compared to sales made earlier in the century through terminal facilities. This would appear true when one considers the great decline in the relative quantity offered for sale by one seller (seller's agent) as well as the relative decline in the level of market information likely possessed by sellers under decentralization. The effect on the equilibrium level of prices in shifting from a centralized to decentralized system has yet to be determined. 2) Establishment of price through auction (buyer vs. buyer) had its greatest growth during the 1930's and had a resurgence during recent years. Development of modifications of the auction process including dutch auction, telo-auction, sealed bids, etc., have seemingly been fostered by producers preference for auctions as compared to other types of price negotiating methods. In auction pricing, sellers become passive in the pricing process since competitive pressure is shifted to the buyers. From the standpoint of competition and market knowledge on the part of those involved in the pricing process, this method probably has much to offer if one subscribes to the generally held opinion that buyers are generally more knowledgeable concerning market conditions than are sellers.[2/] 3) "Offer and acceptance"[3/] pricing (seller vs. seller) is a method of pricing which should probably receive additional study as a method of price determination in the pork industry. From an operational standpoint, there is much in favor of this method of buying and selling; however, the contribution of "offer and acceptance" pricing from a pricing efficiency standpoint is less clearly defined. From the buyers position, it would seem to assure a relatively high degree of competition among sellers without the buyer becoming involved in the actual pricing process. Prices vary likely may tend to be lower with only sellers offering than where both the buyers and sellers establish a competitive equilibrium. (124) 4) Various forms of "formula" pricing are becoming increasingly important as pricing methods in the hog and pork industry.(42) For example, many feeder pigs, as well as slaughter hogs, are priced by utilizing a base market price quotation with adjustments for variations in terms of trade. While "formula" pricing may be technically efficient, it does give rise to the following questions: a. How accurately does the selected base price reflect actual

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2/ The behavior of bidders at regular auctions is offered by (128).

3/ For a description of "offer and acceptance" pricing as used in the Los Angeles market, see (163).

market supply and demand conditions? b. How applicable is the base price to the actual commodities being traded? c. To what extent may the base be manipulated by either party to the transaction? and d. To what extent does formula pricing become self-perpetuating?

Certainly, in any imperfectly competitive market structure, the method of price establishment deserves more attention than we have given. By most measures, we cannot deny that structure has changed and perhaps become more oligopolistic or oligopsonistic in nature. Questions as to the competitive nature of the system and of the "equitability" of pricing among the various methods, while difficult to study and research, cannot be avoided.

Hog Pricing Problems

Problems of pricing in the hog industry may be classified into three general categories: 1) The establishment of base prices. 2) The establishment of payments for the attributes of market consignment (i.e., price differentials in recognition of such things as lot size, location, uniformity, shrink, etc.) and 3) The establishment of payment for biological differences (yield, quality, etc.) among individual animals.

The problem of base price establishment is an aggregate industry problem. It involves the general level of prices prevailing the market as opposed to differentials among given lots or individual hogs. It is here that concern is with the general economic organization of the industry, for it is assumed that structure largely determines the behavior of buyers and sellers, and ultimately performance.

Historically, it has been assumed that conditions could be and were created at the central markets for effective competition and the competitive establishment of market prices. Technological change produced an advantage in operational efficiency for decentralized markets. The shift of volume from central markets results in a questioning of their ability to adequately serve as industry price basing points. Though the performance of the market in establishing payments for consignment attributes and for biological differences may not have suffered, and indeed may have improved through decentralization, the establishment of a competitive equilibrium almost certainly is more difficult in a decentralized market.

The second pricing problem is involved with the attributes of market consignment. Here, concern is with value added by such factors as uniformity of the product, volume, and perhaps assurance of quality levels. The problem is concerned with the allocation of value added through "packaging." To be sure, the economic organization of the industry, the relationship of buyers to sellers, will be of primary importance in the subsequent allocation of any value difference arising from the attributes of the market consignment. Little information is available to indicate the probable size of these values or their allocation among negotiating parties over time.

Introduction of carcass marketing has given rise to a host of new problems. Since many of these systems utilize the live market for establishing base prices which are then converted, by some means, to carcass prices, we must continue to be concerned about the efficiency of price determination in the

live market. Therefore, the price basing point must continue to have sufficient representation in terms of informed buyers and sellers and volume available for sale, and that these buyers and sellers be sufficiently informed so as to maintain as competitive a pricing structure as possible, i.e., and the economic organization problem. More research is needed in the area of provision and utilization of information by buyers and sellers. Too much emphasis has been given to whether or not buyers and sellers utilize such information and has not focused heavily enough on the adequacy and effectiveness of information as well as its effect on the competitive system.

The value of biological differences among animals has been well documented. Increasing discrepancies between the value of fat and lean, and the demand of mass-merchandising institutions for uniformity of product, have focused increasing emphasis on biological differences among individual animals. Carcass marketing systems are largely attempts to increase the accuracy with which value difference can be identified. The question of allocation of known value differences among buyers and sellers can have a considerable impact on the rate of development of this purchasing method.

It has been thought that the live market prices individual lots of hogs on the basis of averages. It has been demonstrated that carcass marketing can overcome this "weakness" by identifying, evaluating, and pricing each individual carcass. It has been further thought that live market price differentials among grades do not adequately reflect actual value differences as determined at the wholesale level -- that live buyers pay slightly more than "poor" hogs are worth and slightly less than "good" hogs are worth.(35)

Recent research conducted at Purdue University compared weekly average live hog values with live-hog equivalent values calculated from prices established in the wholesale meat trade. This research shows a very close relationship between the live and wholesale markets in the establishment of the value of a "typical" market hog, and indicates the wholesale meat trade could serve as a price base equally as satisfactory as that established in the live market. However, when a comparison was made of the recognition of biological differences (as indicated by grade and weight) at the two marketing levels, some rather large price differences were uncovered. (Table 1) surprisingly, the live market reported larger premiums in the 1964-1967 period than the wholesale meat trade warrant (Table 2).

Table 1: Relationship between price differentials reported by the live market and those calculated from the wholesale dressed meat market, weekly average data, 1964 through 1967

Description of Differential	Correlation Coefficient r	Coefficient of Determination r^2	95% Confidence Limits on p
180- 200 lbs. minus 200-220 lbs; Grades 1 and 2	.1687	.0285	.04 and .29
200-220 lbs. minus 220-240 lbs.; Grades 1 and 2	.4657	.2169	.35 and .57
200-220 lbs. minus 220-240 lbs.; Grades 2 and 3	.3110	.0967	.18 and .44
220-240 lbs. minus 240-270 lbs.; Grades 2 and 3	.5243	.2749	.41 and .62
1 and 2 minus 2 and 3; 220-220 lb. weight range	-.2132	.0455	-.34 and-.07
1 and 2 minus 2 and 3; 220-240 lb. weight range	-.2479	.0614	-.37 and-.10

Table 2: Average Differentials between Weight and Grade Categories, 1964-1967 a/

Description of Differential	Live Market	Wholesale Meat Market
180-200 lbs. minus 200-220 lbs.; Grades 1 and 2	$ -.408 (.274)	$ -.182 (.153)
200-220 lbs. minus 220-240 lbs.; Grades 1 and 2	.287 (.259)	.019 (.217)
200-220 lbs. minus 220-240 lbs.; Grades 2 and 3	.177 (.177)	-.041 (.184)
220-240 lbs. minus 240-270 lbs.; Grades 2 and 3	.561 (.257)	.209 (.194)
1 and 2 minus 2 and 3; 200-220 lb. weight range	.705 (.284)	.526 (.138)
1 and 2 minus 2 and 3 220-240 lb. weight range	.611 (.223)	.466 (.157)

a/ Figures in parentheses are standard deviations.

This study does not support criticism of the packing industry in regard to size of premium. Instead, it indicates that the industry has been paying larger live market premiums than can be justified by the wholesale meat trade.4/ In contrast, recent studies by Skadberg(122) at Iowa and Madsen(17) at Illinois, raise serious doubts as to whether the live market through price is recognizing biological differences in any meaningful way. If the live market is not recognizing biological differences, then what is the source of the premium information reported by the Livestock Market News Service? Is it possible reported live differentials are attempts by market reporters to explain the spread in transaction prices that come to their attention? If so, as Madsen suggests, market news reports may add to uncertainty and decrease pricing accuracy.

On the other hand, consider the following possibility if the reported differentials are, in fact, being paid in recognition of weight and grade differences in the live market. Though mostly supposition, perhaps the power structure in the marketing channel is such that retailers, in order to fulfill quality needs, are able to pressure packers into establishing premiums for quality at the live level, but refuse to be bound to premiums at the wholesale level. Supporting this supposition is the fact that basic recognition of quality at the wholesale level is manifested through relatively small price differentials based on weight, as compared to pricing at the live level by weight and grade. If this hypothesis were valid, consider the role which mandatory grades, identifiable at the retail level, might play in allocation or re-allocation of resources through the marketing channel.

If, as has been suggested, the live market is paying premiums in excess of those warranted by equivalent value differentials as determined by the wholesale meat trade, then carcass weight and grade systems based on USDA grades would prove inadequate to compete with current live market differentials. This would seem to explain packer's aversion to the use of USDA grades in their carcass systems in favor of more highly selective systems which result in the paying of greater premiums.

Another feature of the premium question that needs clarification concerns the uniformity of the margins between live prices and wholesale values across weight and grade groups. To deal with this question, Ikerd(59) developed a concept called "price signal refraction" as a testable measure of distortion of price signals. The presence of equal margins across the various weight and grade categories was taken to indicate the absence of price signal refractions. They found evidence of price distortion in the market for hogs.

Armstrong and Bache adopted Ikerd's concept of "price signal refraction"; however, their analysis is based on time series, whereas Ikerd worked with cut-out data at a point in time. Armstrong and Bache also found "price signal refraction" indicating distortion of live-wholesale margins across weight-grade categories. The analysis further indicated

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4/ This study did not attempt to measure in-plant gains from increased product yields or merchandising gains beyond the wholesale commodity market level for hogs of superior quality.

that live-wholesale margins are greater for the extreme weight categories than for the central weight-range. Perhaps buyers are able to discriminate against hogs in the extreme light and heavy weight categories or perhaps there are real value differences not recognized in the analysis (such differences might arise from in-plant inefficiencies, reduced offal credits, etc.).

After comparing wholesale values and live prices, we find research on the possible power positions originating from different economic organizational structures woefully inadequate to provide a basis for formulation of meaningful hypotheses which might explain results of studies of this type. For example, studies documenting price differences at various levels of the marketing channel are useful; however, they are often not designed to explain why these differences occur.

Role of Pricing System?

In terms of researching the technical efficiency and institutional aspects of livestock marketing, economists have devoted considerable resources, but have woefully neglected the area of economic organization and allied area of pricing efficiency. A major problem which is now facing the livestock industry is concerned with the development of new and alternative pricing mechanisms and their effects on returns to the various segments of the industry. That we have failed to develop an adequate research base will certainly hamper our efforts in this area; nevertheless, the question concerning the role the pricing mechanism should and can play in many of the newer organizational arrangements remains, and must be studied.

If we are to continue our dependence on the competitive price dominated system, then should we not devote more of our attention to studying the various competitive arrangements? If so, what criteria will we use by which we measure whether reflection of supply and demand conditions are being achieved? In terms of biological pricing accuracy, what are the physical and biological limitations that a system should tolerate? What competitive arrangement should we strive for which would have a sufficiently responsive pricing mechanism to reward sellers in line with product value and services rendered at any point in the production-marketing complex at which they would like to relinquish title?

Perhaps the competitive pricing system is to be replaced by other more appropriate systems tuned more closely to the need for increased technical efficiency and total coordination. Indeed, the relevant question might well be, can the pricing system as we know it, in an atmosphere dominated by inequalities among buyers and sellers, survive along side a system of total coordination and immediate response to central management? Perhaps more important yet, should it?

IMPLICATIONS OF DEVELOPMENTS IN THE PRICING STRUCTURE OF THE LIVESTOCK-MEAT ECONOMY

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Texas Tech.

The implications with which I shall be concerned in this paper are those which I believe may be of principal interest to researchers and research administrators. It seems necessary, however, to precede observations concerning implications with additional comments about the pricing structure of the livestock-meat economy and changes in it.

Despite all of the pseudo-sophistication in economics research, we do not actually seem to have learned a great deal about prices, pricing, and the internal structure and functioning of pricing systems. Detached statistical and econometric views have provided some solid knowledge, but, in general, pricing systems remain intangible sources of mystery and awe to those on the outside and to many, perhaps most, on the inside. A review of the literature suggests that, while we remain well informed on the physical structure of markets and channels, we tend to avoid the subject matter area in which the economist generally is supposed to be the principal authority. And when field inquiries are made, large quantities of research resources often are expanded, even though the work generally does not proceed beyond an initial descriptive phase with few tangible results.

Pricing implications of research and proposals concerned primarily with cost and operational efficiency often are neglected entirely. This is most unfortunate, since most of the public problems and issues arising out of changes or adjustments in structure or practices are concerned with prices, equity, and the allocation of proceeds among contributing resources. Charges or adjustments in structure and strategy are made by individual firms in a free economy for the primary purpose of reducing costs and improving operational efficiency. Thus, improvements in operational dimensions of industry performance take place more or less automatically and without special inducements.

Recognition, of course, must be given to numerous examples of "institutional foot-dragging" and of atomistic structural situations so afflicted with institutional barriers that adjustments to take advantage of organizational or technological efficiencies cannot be made. Many examples of this, as in the marketing of hogs, have been cited in papers at these meetings. In allocating research dollars, however, we are left with the question of relative importance of these problems. If the basic problem actually is an institutional one, I am not sure that studies concerned exclusively with costs or efficiency of alternative structural designs and channels are particularly helpful. In addition, with each alternative structural design there are implications with respect to prices and pricing, as well as with regard to cost and efficiency.

I continue to suggest a "total systems" approach in my papers. I suggest approaches which gives more directed attention to prices, pricing and the non-price terms of trading arrangements and to the matter of institutional barriers to change. We have gone far enough for the time being, it seems to me, in quantifying deficiencies in our livestock marketing systems.

The Changing Character of Pricing Systems for Livestock and Meat

The National Commission on Food Marketing accepted the view that pricing is "an increasingly serious problem."(86) Authors of this statement, however, appear to have been thinking more about price reporting and of vested interests than of pricing. They recognized problems arising out of "exchange arrangements" in which livestock and meat products "bypass established markets." They pointed to a "serious question of growing significance (concerning the) representation of general supply and demand conditions" at established markets. "The state of current market knowledge available to many buyers and sellers" was considered "less satisfactory to rely upon in making trading decisions" than earlier. The Commission report continues as follows:

> "The pricing of livestock and meat, historically a relatively inexact process, has been improved little, and many new problems have arisen. Pricing practices, along with other exchange arrangements which have been substituted for transactions at established markets, will require increasing attention to assure effectiveness and efficiency in allocating resources and distributing income in the changing livestock-meat economy.(86)"

I disagree with much of this statement and preceding comments not so much for what they contain as for what they exclude. The commission staff failed to grasp a modern view of the meat industry. Regardless of what we might have to say about price reporting, pricing performance and efficiency in the livestock and meat industry has, in many respects, been substantially improved.

Changing Industry Structure and Price Reporting

The Food Commission staff avoided or overlooked some of the more important dimensions of structural change in the meat industry. The important dimensions today are not size of packing plant, degree of concentration meat packing, or concentration in packer sales as compared with concentration in retailer purchases. Relative trends over time in this regard is more important. Clearly, there has been a much stronger and more persistent trend toward concentration at the retail level. Of even more significance is the fact that the industry has changed since World War II from a purely localized distribution system of many minor markets and supply areas to a highly commercialized, national, carlot volume distribution system. The degree of specialization by packers with respect to market area, type of customer, product handled and services rendered are much more important dimensions of structure today than size. The heart or control system of the beef industry today consists of 1) large scale feedlots selling on a continuing basis, possibly with standing arrangements, to 2) relatively large "shipper-type" independent wholesale beef packers shipping in carlot

quantities directly to 3) retail food chains, both corporate and affiliated, and wholesale beef breakers. So far as prices and pricing are concerned, the remaining structure of the industry can be almost entirely neglected. These are satellite elements which relate themselves in terms of practices and prices to the main core of the system.

Livestock and meat are now traded, and priced according to relatively uniform grade, quality and weight specifications. As many packers have admitted to me they no longer find it possible to "steal cattle" from someone and, at the same time, they sell to retailers according to more precise specifications. On any given day, the price structure for varying grades, qualities and weights is well established and to a much greater extent today then earlier, price differences reflect differences in value.

Regional differences in prices more nearly meet perfect market criteria than at any time in the past. In traditional atomistic market situations, it is true, prices at one market compared with others, or prices of certain grades of qualities relative to others are permitted to "get out of line" for substantial periods of time. In this respect, atomistic market situations are not particularly perfect or efficient with respect to prices and pricing. In the livestock-meat industry of today, the nation does not consist of a dozen or more markets as viewed by many local market interests and many USDA market reporters. It is, essentially, one large closely interrelated market for which the industry has clearly indicated that minor and unjustified price variations, geographic price differences not explained by transportation costs, grade or quality differences not explained by production cost differences or the cost of processing will not be tolerated. With principal exceptions of the West Coast and portions of the South, which retain characteristics of separate or distinct markets, differences among regions in supply relative to purely local demands are not recognized.

Within a modern industrialized economy with the means of communication in use today, some degree of institutionalism in pricing is inevitable and must be accepted. Already, many aspects of pricing systems for highly standardized agricultural products have become institutionalized and will become more so. This does not mean that laws of supply and demand will no longer function. They will, but they will do so within the framework of managed and institutionalized terms, arrangements and price differentials. More nearly today than before, the total national supply relative to national demand determines a price structure which is reflected in prices within every supply area in the nation. It is not surprising, therefore, that the Commission found that "on a given date, a definable geographic pattern has prevailed for dressed meat prices.(86)"

A principal problem is that no price reporting system has been devised for agricultural products which meets modern needs and requirements. The industry wants and will use a price reporting system which clearly and adequately reflects the national pricing structure and provides a basis everyone can use in pricing. In contrast, USDA attempted for years to design price reporting services almost exclusively on a local live animal basis. Each market was reported as if it was a separate world of its own. When the importance of wholesale and carlot carcass prices and pricing finally were recognized, meat price reporting services of USDA were expanded, but the local orientation was retailed.

The National Provisioner Yellow Sheet is so widely accepted and used, partly for the reason that it more nearly meets modern needs of the industry than other alternatives.1/ This is not to say that the Yellow Sheet is accurate, free of problems, or the best that could be devised. Acceptance and use of the Yellow Sheet cannot be entirely written off, however, to habit or use by competition. Recent interviews generally included a statement which recognized a need for "some type of widely accepted daily price basis."

Much of the concern about the Yellow Sheet is based on statements and reports, often poorly founded, about how "The Sheet" is used. Formula pricing based on "The Sheet" according to general impressions has reached serious proportions. Before considering this matter, however, the Yellow Sheet itself deserves some attention.

Provisioner Policies and Practices

Prices reported, according to National Provisioner management, are "prices paid in a free and open market place . . . by willing buyers to willing sellers . . . for standard quantities of standardized merchandise of acceptable condition and quality."(96) Prices associated with the "distributive market" are avoided. The distributive market is defined as "controlled distributive channels to retail outlets serving the ultimate consumer" or as "regular and established accounts." The prices recorded are those associated with the "open market" where "product is offered for sale to anyone interested in buying."

The daily Yellow Sheet has its own staff of 6-7 full time "editors." Each of these editors covers a specific segment of the trade in the Chicago trading area. This area is defined, essentially, as the area of the United States east of the Rocky Mountains and North of the deep southern states.

"Each of the editors is on the telephone continuously through the day talking with slaughterers, packers, processors, wholesalers, jobbers, large buyers, and brokers." Each trade, according to Provisioner management, is verified. "Only after a trade has been confirmed with an opposite principal or the broker involved, can the trade be considered a publishable fact."

The facts gathered are evaluated. According to the Provisioner spokesman, time, condition of product, volume of trading and circumstances of sale all are considered. "Printed quotations reflect the level of the market at the close of the trading day" defined as "whatever time trading closes on a particular item or product."(96)

Although Provisioner management demonstrates considerable pride in present policies and practices and is to be commended for the job that is being done, the description and explanation offered, as we shall see, lead to many questions. Many of these same questions can be raised about the USDA market news services.

1/ This seems to be suggested in data reported by the Commission on use value of the various reports. See Technical Study No. 1, p. 56.

Formula Prices and Related Marketing Practices

With the changes in structure have come changes in market strategy and practices which have affected pricing patterns and practices. During the 1950's, the corporate chains, followed by the affiliated groups, stepped up their drive for close adherence to specifications and trading terms advantageous to them. Chains without meat warehouses insisted upon individual store delivery and this kept many smaller local packers and distributers alive. The shipper-type packers, now including a few plants of national packers, continued to offer truckload quantities for sale to anyone, anywhere and preferred single destinations. To increase their services, some have shifted more to breaking at the packing plants.

The chains began to build more meat warehouses partly to take advantage of the more attractive terms offered by carlot shippers. Others were seeking product differentiation through aging and still others held strongly to the belief that rigid quality control required retailer control of the breaking and fabricating functions. The chains also began pushing toward regularized meat buying programs.

The evidence concerning the prevalence of formula pricing as an integral part of the meat program seems to me to be rather startling and, at the same time, conflicting and inconsistent with recent observations. The Food Commission asked packers to report percentages of transactions with most important customers in which prices were tied by formula directly to a particular quotation in 1964-65. The aggregate answers were 41 percent for beef and veal, 24 percent for lamb and mutton, 41 percent for fresh and frozen pork, 29 percent on curred hams, picnics and bacon and 20 percent on other processed meat.(96) In nearly all cases, the Yellow Sheet was cited as the quotation source.

Stout and Hawkins provide us with more detail than found elsewhere, but the area of inquiry was highly restricted.(131) Percentages reported by these authors are surprisingly high. The finding that the retailers in Ohio, excluding A & P, purchased all of their beef and pork on a rigid formula basis is rather difficult to accept at face value and, of course, the authors do qualify their findings considerably. Findings regarding size of the differentials over the Yellow Sheet also are surprising.

The Livestock Market News Branch of C&MS in USDA also reports in a personal letter to me relatively high percentages of beef sales on a formula basis in all regions except the West Coast. Estimates for the various regions generally exceed 65 percent with some placed as high as 80-90 percent.

After interviewing a number of packers in different areas recently, my impression is that mainstream packers, the shipper-type packers, are fiercely resisting formula pricing in any form. All do at least some of it -- more generally than the packer is willing to admit -- but a good deal less than often is supposed. As a matter of fact, there is a relatively strong movement underway among packers at the present time to more effectively merchandize their products -- to replace "order takers" with "hardline merchandisers." All of the national packers are re-emphasizing merchandising.

The aim is to sell each day, at highest prices obtainable without special regard for price reports on trading the preceding day.[2/] A return to emphasis on merchandising also is evident among many of the shipper-type independent packers. Most of the packer representatives with whom I talked flatly stated that the established policy of the firm was to sell competitively in the open market on a basis in which the price was firmly established when the deal was made -- regardless of the agreed upon shipping or delivery dates. Most also admitted that they were only partially successful in enforcing this policy. The policy and the emphasis, however, were clear cut. Percentages representing formula selling anywhere near those reported by Stout and Hawkins and USDA generally were flatly denied.

Implications

I turn now to implications of all of this primarily for research. Obviously, much remains to be learned through research of some type.

In considering research, the usual approach suggested would begin by attempting to establish, with some precision, deficiencies in present systems of pricing and price reporting. Conceptually, the approach would attempt first to determine "what is" and then turn to the task of determining what "ought to be" and finally devise and test schemes for achieving what "ought to be."

In this approach it would be decided that an initial descriptive study directed toward questions such as the following was needed.

1. Precisely what types of sales or trades are considered eligible for use by Yellow Sheet editors and USDA meat reporters. More particularly, what types of transactions qualify, according to Provisioner management, as "distributive" or "nondistributive?"

2. With respect to both the Yellow Sheet and USDA market services, what proportion do "nondistributive" or eligible transactions represent of the total carlot market for carcasses and primal cuts and how do these proportions vary by area, species or product and through time?

3. Are the eligible transactions that are reported to Yellow Sheet or USDA reporters representative of all eligible transactions.

4. Do the Yellow Sheet and USDA eligibility requirements differ, and if so, how?

5. Precisely how are prices at various locations in the "Chicago trading area" adjusted to a Chicago basin, how are "the appropriate prices and rates selected," and how are inconsistencies arising out of this process resolved?

2/ National packers also are attempting to regulate the volume of slaughter according to prices and margins rather than maintain a continuous high volume of slaughter to minimize kill floor costs.

6. What are the alternative effects on supply area prices of alternative methods of adjustments?

7. What is the relationship of prices associated with eligible versus ineligible transactions, and what changes occur in this relationship?

8. What are the various forms of formula pricing, how important by areas, species or product and type of buyer or seller is each type, and what are the price relationships among the various types?

9. How important is formula pricing on a fixed forward basis, what are the circumstances of these transactions by area, type of buyer or seller and product, and what are the trends involved?

10. To what extent and under what conditions could prices developed through use of formulas be considered eligible for reporting?

11. How are the Yellow Sheet or USDA reports employed in the various types of formulas by chains, packers, other retailers and others by types, area and product?

12. To what extent and how are eligible transactions reported to Yellow Sheet and/or USDA reporters actually verified?

13. How and to what extent is the Yellow Sheet used by packers in determining prices they will pay for livestock?

14. How and to what extent does use of the Yellow Sheet and formula pricing contribute to a uniform pricing structure at the packer level or on a delivered basis to chains?

15. Is there, in effect, tacit collusion among packers or among chains through adoption of similar formulas and use of the same price basis?

These are only examples. Most require such detailed and intimate business information that coercive power or power to inspect individual firm records probably would be needed. For this purpose, possibilities for joint participation in a study with P & S might be explored. If formula pricing has reached the proportions suggested and is having some of the effects alleged, then P & S should be giving this matter serious attention.

Reliable answers to all of these and related questions, even if they could be obtained, would require a considerable expenditure of research funds. After the answers were obtained, the project would not be complete. About all that would be accomplished would be a more complete description and specification of the problem. It is possible, but unlikely that at this point remedial regulations or legislation would be proposed and strongly supported by producers and others. More likely, the study would bog down in meaningless detail because the more relevant detail remained out of reach.

At some point, it would be discovered that it is practically impossible to determine whether or not a current or historical reported price is or is not "accurate." In the second stage of the project, it would be found that clear cut standards and criteria for determining what "ought to be" with respect to pricing performance of an industry under modern industrialized conditions and to price reporting are lacking. Conventional criteria, never entirely appropriate, are less so today than ever.

Despite the negative nature of these comments, it seems obvious that at least a modest effort should be made to bring together whatever information could be assembled through interview techniques. While I would not place all of my "eggs" in this particular basket, an improved understanding of the pricing systems and of price reporting policies, practices and techniques could be established. Some of the questions and possibilities in this connection deserve more detailed attention here.

Do Reported Prices Represent Prices of Livestock and Meat Flowing in the Mainstream of Trade?

The Yellow Sheet and USDA meat price reports, it appears, contain information obtained largely outside what I have referred to as the mainstream of the meat industry. This, together with the fact that no one has developed fully satisfactory means of sampling and reporting mainstream prices may be a significant portion of the total price reporting problem. On the basis of certain assumptions, it could be argued, as Provisioner people do, that the "open market" is a more sensitive but, nevertheless, representative market. I am not sure that there is not some inconsistency here or that the sensitivity is required -- it generally is not reflected on through to retail prices.

Given the eligibility requirements for price reporting to Yellow Sheet editors and USDA reporters and the changing status of industry structure and practices, the open market clearly is growing ever smaller. Eligible trades represent a declining percentage of the total. This is generally admitted. The Chicago USDA meat reporter, as well as Provisioner management state flatly, however, that this is not a problem at the present time. The USDA reporter attempts to report the price, or practical range of prices, on carlot quantities of specific grades and weights that actually moved the principal volume during the day. Apparently there generally is sufficient carlot volume in the Chicago area for this purpose. Even so, this volume usually includes meat which did not enter or leave the Chicago area but was handled by Chicago brokers and the report often is issued with the statement "no sales" in particular categories. The Provisioner has solved the problem for the Yellow Sheet, for the time being, by redefining the Chicago trading area.

Do Provisioner Practices Tend Toward a Fixed Geographic Price Structure With Possible Inequities?

The Yellow Sheet provides prices for the eastern two thirds of the Nation adjusted for transportation cost differences with Chicago as the base point. There is considerable question concerning the ability of a private firm or any single agency, to accomplish this task properly and to the best advantage of all concerned. The typical example given is a shipment out of

Denver or Omaha for New York in which the implied Chicago price is the same regardless of whether the fob price or the delivered price is used with transportation costs as the basis. The formula works fairly well within the territory under the direct influence of the northeastern market -- areas subject to the excess demand of that market.

Numerous other examples could be presented, however, in which the implied Chicago price is $.50 - $1.00 higher or lower when based on delivered prices as compared with fob prices or on alternative delivery point prices. The implied price at Chicago on a shipment from Denver to Atlanta often is $.75 under the Chicago price of the same or a similar shipment to New York. Throughout the past summer, USDA reported two prices at Denver for the same weight and grade -- one for eastern shipment and one for western shipment -- despite the admonition often given in economics classes -- that in efficient competitive markets there is one price at one time for an identical product. Is it possible that this is one result of a geographically structured pricing system?

The practice of adjusting prices at other markets to a Chicago base price leads to other problems. For example, the transportation cost employed generally does not include all necessary transfer costs. Then, too, there is the question of which transportation cost shall be employed. The truck load rate from Chicago to New York usually is quoted as $1.50 but this is an average figure. The piggy-back rate is $1.25. Which should be used in adjusting New York prices? Transportation costs often are not the same in both directions between two markets. It is also well to remember that while the system may operate satisfactorily within the trading area defined, the Yellow Sheet is used by all sectors of the trade everywhere.

It appears entirely possible that some formula pricing arrangements among carlot suppliers and buyers are a direct result of price reporting practices and policies of the Provisioner. Arrangements which adjust the implied geographic price structure by a constant relative to Chicago may have been considered necessary to offset inequalities or disadvantages imposed through the use of theoretical transportation costs.

Do Closing Prices Necessarily Represent Changes In Pricing Which Moved Most of the Product During the Day?

A closing price undoubtedly is useful in decision making. The amount of price change during the day, highs and lows, or the prevailing price during the day, however, also are important. In commodity futures markets, for example, high, low and closing prices are reported and each of these is important to commodity futures traders. The "open" fresh meat market which the Yellow Sheet is attempting to report must be fully as volatile as the futures market.

Much of the trade does not remember that Yellow Sheet prices are supposed to be closing prices. Those familiar with open market trading and prevailing prices the preceding day, therefore, often charge the Yellow Sheet with error when, in fact, there was no error according to policies and practices of the Yellow Sheet staff.

According to Yellow Sheet personnel, "facts and specifications surrounding each traded item are given full consideration. These facts and circumstances include weight range, grade, cut, selection, freight terms, whether the product is fresh or frozen, age and time of shipment." However, price differences are not reported for all of these variations. Instead, the report implies that no price differences associated with yield, grade or variations in quality within the grade existed. Considering these differences, as well as the many differences and inconsistencies arising out of adjusting prices for transportation cost differentials, Yellow Sheet editors, it appears, are left with more responsibility for the exercise of individual and subjective judgment than they would like to admit.

Is The Yellow Sheet Vulnerable to Manipulation?

In combination, eligibility requirements imposed by the Provisioner and the restriction to closing sales along with other self imposed restrictions, necessarily narrow the available population of sales considerably. The selection of closing prices requires a selection of closing trades and to one degree or another this must be an arbitrary process. The sample of open trades selected as closing necessarily is smaller than the total number of trades for a given weight and grade. In short, closing prices require more judgment and are more vulnerable to effects of a few "planted" sales. On the other hand, the USDA price ranges reported often are relatively wide and apparently are less useful to the trade. Definitions of the extremes are not always clear.

Yellow Sheet editors rely heavily on brokers. According to packer reports to the Food Commission, however, brokers handled only 16 percent of the packer sales of carcass and primal beef. Some, unknown percentage of these sales must represent distress or emergency sales.

Several brokers have stated in informal interviews that they had, and within limits could, manipulate the Yellow Sheet. It seems that techniques have been developed which induce Yellow Sheet editors to use price reports of "private sales" which cannot be checked.

Yellow Sheet also rely heavily on two national packer sales offices in Chicago. According to Chicago area brokers, renewed emphasis by packers on merchandising frequently causes them to be "out-of-line" in their pricing and, more often than not, on the low side. In turn, the packers, both national and other, charge brokers with reporting distress trade prices. In any case, both consider Yellow Sheet prices low.

To the extent that it exists, the practice of formula pricing on a fixed forward basis increases incentives for manipulating Yellow Sheet prices. In some degree, USDA reports as well as the Yellow Sheet are vulnerable. It must be nearly impossible to fully verify even a high percentage of the eligible trades in an area which includes more than half of the nation.

What is Formula Pricing?

It is possible that formula pricing is being used as an excuse by some packers to avoid reporting to USDA and Yellow Sheet editors. It also is likely that while all packers use the Yellow Sheet in selling and often, even generally, quote prices in relation to it -- as so much over or under a specific Yellow Sheet price -- relatively little moves on a fixed, rigid and continuing formula basis. Yellow Sheet prices are a common basis of understanding and communication. A Denver packer, for example, might sell to a buyer at 50 cents over the Sheet plus transportation today and on each buying day for several weeks and, at the same time, honestly believe he is not "selling on the Sheet" or "on a formula basis". The buyer, however, may assume that a formula arrangement has been developed.

The important thing is not the extent or degree to which the Yellow Sheet enters into the pricing process. The purpose of the Yellow Sheet and of the USDA meat price reports is to serve as an aid in decisions regarding prices and pricing. I see nothing particularly wrong with a formula pricing arrangement, defined as a predetermined mechanism or procedure for arriving at a mutually acceptable price, so long as there is opportunity and bargaining latitude for additional negotiation and a final decision is made at the time of sale. In my judgment, such sales could be considered open market sales. The problem arises when the price on a sale today will be determined on a formula basis a week from today upon shipment or delivery of the product. If this is a predetermined and automatic process in which the only variable element is the Yellow Sheet price a week from today and there is no recourse after today for either buyer or seller, then, of course, numerous problems arise. The price today obviously cannot be reported and if the practice becomes sufficiently widespread there will be no price next week or any day on which to base the formula.

In my judgment and on the basis of discussion with packers, brokers and others, formula pricing on fixed or automatic forward bases has not reached serious proportions in the mainstream of the U.S. meat industry. The Yellow Sheet and the USDA 2:40 wire out of Chicago are being used directly and indirectly, perhaps more than is desirable, by meat packers and retailers in arriving at mutually satisfactory prices. But most of the fresh and processed meat offered for sale by packers is moving at a price which has been firmly determined and fixed on the day the original agreement was made. In general, even the product required for specials a week or ten days hence is sold with price fixed at the time of the initial contact. More detailed information about this, however, is needed.

How Is Formula Pricing Affecting Prices and Sales of Livestock?

Although little is known about the impact of formula pricing at the producer level, we do know that to an increasing extent cattle and hogs are sold on some types of carcass basis. Following changes this year in P & S regulations, carcass grade and weight selling seems to have increased sharply, and this trend probably can be expected to continue. Several feedlot operators in Texas stated that they had entered into discussions with packers directed toward the development of satisfactory formulas for use in grade and weight selling. A number of packers announce daily carcass grade and weight

prices which, in effect, are based on formulas founded, in turn, on their own selling prices the preceding day or Yellow Sheet prices. Some feeders also are beginning to contract cattle to packers, as a hedging device, at the time the feeders are placed for finishing.

I suspect that the formula pricing of livestock sold on a carcass grade and weight basis will increase. In general, however, prices associated with these sales are and will continue to be determined finally on the day the livestock are delivered to the plant and slaughtered. P & S regulations require immediate payment. So long as the formula is applied on this basis and results in prices satisfactory to both buyer and seller, I see nothing particularly wrong with it. However, this question also deserves more detailed study. Pricing implications of the proposal presented here by Kendrick concerning the packing of livestock and sale on a Yellow Sheet formula basis warrant careful study.

A More Postive Approach to Improved Price Reporting

Although much descriptive work is needed, it seems to me that another more feasible and more effective alternative exists. In this approach the researcher would shift his attention from deficiencies of present systems of price reporting to the task of designing an improved one. In this approach, it would be necessary to fairly admit the special advantages and features of the Yellow Sheet which make it so useful and popular. While deficiencies in both Yellow Sheet and USDA systems would need to be recognized, there would be little need or use for quantitative measurements of these deficiencies. An alliance with C & MS Livestock Market News Branch probably would be essential.

The research would be directed to the question, "What type of Federal livestock and meat market news service actually is needed today or will be needed 10 years from now if we are truly interested in serving the needs of the industry, including producers, as accurately and meaningfully as possible?" I cannot know precisely what direction such research would take, but I have some ideas.

I could involve attempting to determine the kinds, types and timing of price and other information actually needed by modern commercialized cow-calf producers, feedlot operators, meat packers and retailers. Does anyone, for example, need or use data on terminal market prices? How important and to whom are improved data on feeder cattle prices and movements? Are both fob and destination prices on carlot movements of beef or pork needed? Should high, low, average, or closing prices, or all of these, be reported? What is the best timing during the day for reports of various types and which, actually, should be released several times during the day, daily, weekly, or monthly?

With such information, researchers might begin the task of designing an improved system. Concerning prices, suppose USDA were to adopt tactics of the Yellow Sheet and centralize reporting on dressed meats as well as live animals at Omaha. Many of the area reporters would be retained, but their data take out and information would be channeled to the central location for evaluation, compilation, interpretation and summary. The process for

verifying all trades would be coordinated. While fob and destination prices might be reported, all eligible prices would be adjusted to the central location and reported in much greater detail. Improved and more reasonable methods of adjusting prices to the central location would be devised. A computerized spatial equilibrium model possibly could be run each day which would provide implications for each major supply point and market of the central market price report. An Atlanta price consistent with the Central point price and prices at all other locations would be released each day. An organized, integrated, and coordinated network of geographically consistent prices would be released. This does not mean that actual prices at specific locations above or below justified levels would be ignored. Instead, these would be highlighted and reasons for them explained.

Would such a price reporting system lead to more formula pricing than before? Possibly, but opportunities for manipulation would be greatly reduced. In addition, if the more stable mainstream prices were reported, the need for forward pricing formulas might be reduced.

Pricing, Price Reporting, and Bargaining Power

I have argued that "bargaining power" is a "total systems" corrupt and is affected by all usable elements and variables affecting individual firms. It is not improved greatly, I believe, within the framework of a microcasm. Accordingly, we must carefully examine the rising number of schemes and plans involving fixed contracts and formula pricing arrangements for long term and industry-wide implications. Those developed primarily for the purpose of capturing operational efficiencies should be analyzed for pricing implications. Contracts and formulas which permit a number of small producers to acquire the cost advantages of larger producers could be the source of additional institutionalism and rigidity tending to inhibit future adjustments. The trailer industry, for example, is well supplied with contracts, but there is little producer bargaining power associated with these contracts. A contract and institutionalized pricing arrangements are not essential elements of a program to improve farmer bargaining power. 3/

Farmer bargaining power is affected by government services and regulators as well as by internal structural relations and practices. Official Federal grades and grading, for example, have had a significant effect in the beef industry. Bargaining power also is affected by the level and relative distribution of market knowledge. The preceding discussion, therefore, is relevant within the present context. Improved systems price reporting and communications may be the logical beginning point in work toward improved farmer bargaining power.

3/ See my papers and testimony included in (164)

COMMUNICATIONS AND PRICING -- WHAT WE KNOW AND WHAT WE NEED TO KNOW

Patrick J. Luby
Oscar Mayer & Co.

I have been asked to discuss papers presented on this morning's program and make further comments on the subject of needs on communication and pricing in our industry. I have been impressed by the quality of the ideas expressed in the papers, in the discussion of them and in the interest shown in the subject. I have the same uneasy feeling that some of you have expressed -- that we take bits and pieces of our livestock and meat marketing system and study them very thoroughly but lack the time and resources to really pull them together so that we can 1) state what the optimum system would be to serve society's best interest in the future and 2) state what is needed to get our industry to that system if we are not now there. Perhaps this is an impossible task and therefore we are doing only the possible within the real constraints of time and other resources available.

Unfortunately, I did not receive all the papers in advance. But I would like to comment upon at least one in particular. I believe Willard Williams presented an excellent discussion of the pricing structure of the industry -- one of the best and most objective I have read. He also provided us with what I believe is the best discussion of formula pricing and the National Provisioner quotations that has come to my attention. I would recommend a re-reading of this paper.

Pricing

Stout and Schneidau gave us their thoughts on improving pricing accuracy. If I have a complaint here, it would be that I believe we sometimes become too narrow in our perspective, too narrowly define pricing efficiency and don't consider all the implications.

If we stay with the more narrow definition of pricing efficiency which I believe most of the authors did today, what are the implications? In an attempt to arrive at the implications, I have analyzed the various sectors of the meat-livestock industry.

After a brief search of the literature with the cooperation of the Supermarket Institute and from conversation with retailers, it is my conclusion that at retail, fresh meat in general and fresh beef in particular are sold at prices which do not cover full costs of retailing compared with fresh pork and processed meats. When full retail costs are calculated, retail margins are thought to be considerably lower on fresh meat than on processed meats. There are the usual problems of isolating and allocating overhead costs in this problem.

It is generally believed that in the packing industry processed meats carry a slightly greater margin than fresh meats. Evidence presented in the study done for the National Food Commission showed that for the ten most recent years, 1955-64, that packers who sold only processed meats had higher average earnings as a percent of new worth than other meat firms. (86)

Data from the Annual AMI Financial Facts About the Meat Industry in the returns to net worth from different kinds of meat companies also substantiates this.(38) Data from the Food Commission study showed that returns to packers who slaughtered only cattle were slightly larger than to firms which slaughtered only hogs.

At the livestock market, I agree with some comments made by Stout and Schneidau. I believe, along with Stout, and our data would support that most livestock buyers are far from perfect in judging meat values and quality in live animals. And I believe Schneidau is correct in saying that in hogs most of the value differences due to variation in grade are compensated for by livestock prices received in the live market. However, our experience and data show that buyers tend to underestimate the carcass yields of high yielding hogs and to overestimate the low-yielders. They tend to underestimate the full range in yield. I submit that this is a human characteristic found elsewhere in businesses, universities and probably in all institutions where the value of a resource or product is difficult to measure.

Our studies also show that in hog production, larger hog producers tend to produce hogs of higher grade and higher yield. Therefore, I believe that our live buying system at least for hogs and perhaps for cattle (our people believe this is also true for cattle but we have not run any studies) tends to overcompensate small farmers and underpay large ones.

What, then, have been the effects of pricing inefficiencies in our industry -- if we define pricing efficiency in the usual narrow manner? I believe the beef industry has been helped and that beef consumption has been enhanced at the expense of the pork industry. I believe processed meat consumption has been held down somewhat compared to consumption of fresh meats. I believe that the exodus of livestock producers and probably the exodus of farmers in general has been slowed and that the rate of concentration in livestock production has been retarded. I believe that the rate of progress toward "better" animals has been impeded. In hogs and pork, I don't know how serious this has been since we have such a high relationship between PSE pork and lean, meaty hogs. Professor Briskey, noted authority in this field from the University of Wisconsin, assures me -- if that's the word that I should use -- that our Madison plant loses over one million dollars per year in yield losses due to PSE pork. Our studies also show that large hog producers are found in areas of highest density of hog production. Therefore, pricing inefficiencies have tended also to slow the geographic concentration of hog production and tended to sustain hog production in what might be called marginal or fringe areas of the Corn Belt.

I would like to see more attention given to the broader implications of pricing inefficiencies. What have been the effects on the diets of our citizens? What have been the effects, if any, on the out-migration from agriculture and resulting urban problems? What have been the effects on the geographic concentration of farming and the human resources and institutions left behind in marginal areas which are having trouble competing in agriculture? If I have sensed any fault with our public research in this area, it has been the narrow perspective of the implications of pricing inefficiencies.

If I may stay in the area of pricing efficiency for a moment more, I wonder if we aren't guilty of being too narrow in its definition. Is it really pricing inefficiency if by lowering prices and margins for fresh beef a retailer can "pull" many more customers into his store than if he lowered prices and margins for fresh pork. And at the livestock market level, as Schneidau pointed out, at some times there are other values in animals than just meat, fat, and other products. With our 36-hour guaranteed payment to labor, sometimes late in the week, especially in the summer, we can justify paying more than the hog is "worth" in terms of marketable product. Since we have to pay the laborers if they don't work at all, we may as well buy and slaughter hogs and "overpay" for them to utilize this "free" labor. This inflexibility causes all kinds of problems and has been given too little attention and research both by you and by us. In the summer, when our industry has large overcapacity, I chide my pork industry colleagues that we pay hog farmers a million dollars a week in prices which are too high in order to avoid paying labor $100,000 per week in guaranteed time simply because our accountants do the same with the former. In effect, we seem to subsidize hog producers who market in the summer compared to those who market in the winter.

Several of the papers, and Stout's in particular, seemed to desire more carcass buying to improve pricing efficiency. We have actively offered this system for many years in cattle and for nearly a decade in hogs. About one-third of our fed cattle, one-third of our cows, and one-tenth of our hogs are marketed under this system. Many producers fear the system and fear packer grading of their carcasses. However, some of my farmer friends have confided that they fear their own hogs more than they fear the carcass grade and weight system. I would like to see you and your extension colleagues more actively study our systems and if you find them to your satisfaction, help to promote them. If they are not what they should be, help us to improve them.

As you know, most packers would like to do their own grading of carcasses. Most packers do not want government grading. This is normal in a free society. You and I want to remain free of a third-party in running our affairs. You want academic freedom. We want business freedom. And we can both probably have it if we do not infringe on valued freedoms and rights of others -- customers, farmers, employees, stockholders, taxpayers, etc. -- in using our freedoms. Also, many packers feel that their freedom to do business has been impaired in the past by government grading in beef. Many feel that it is not used as a classification system so much as it is a merchandising system by retailers. Many believe that if USDA Good was called USDA 013 and USDA Choice was called USDA 012 and USDA Prime was called USDA 011 that this voluntary classification system might not be demanded by as many retailers. The packing industry has had quantitative and qualitative grading for beef for many decades. These are necessary in a product such as fresh beef. How else can I explain why I've heard comment from my wife and from many other homemakers that they really like and will only buy Retailer X's beef when both Retailer X and Retailer Y sell only USDA Choice, Cutability 3 beef. There are differences within this broad government "classification" system and homemakers know it. The packers and retailers continue classifications with the current government classifications in order to describe and market fresh beef.

While talking about homemakers, I believe I detected in some papers discussed today a suspicion of the customers abilities in buying meat. I have great respect for the majority of them. Most of them have the opportunity to make many hundreds of decisions per year and get them judged by their families during the serving of several thousand meals per year. I believe they are, as a group, able to "tell" our marketing system what they and their families want in meat.

There is one other comment I would like to make on pricing efficiency. I am always somewhat disturbed when I see so much good talent and good studies concerning themselves with relatively small differences being paid for livestock compared with its estimated product value and not one word with differences in wages (prices) being paid for labor within packing plants for human resources. I am not speaking about wage differences within different regions of the country where the quality of labor might vary considerably. There allegedly are sizable differences in wages and fringe benefits paid here in the Corn Belt for labor in plants not farm distant from each other.

What are our needs in pricing? We have several in the packing industry. One, I suspect is shared with the retailing and livestock producing industries. That is the need for good, accurate cost accounting. It is difficult to price and to expect prices to accurately guide consumption and production with poor cost accounting. Yet, I suspect retailers don't really know what it costs them to retail all the many different kinds of meat they merchandize through any particular store. I suspect most farmers really don't know what it costs them to produce different kinds and weights of finished livestock and what it really costs them to market it. I know that it is extremely difficult for us to "cost" the many products that we derive from joint products such as cattle and hogs.

The problem of transfer prices in our industry reflects this costing difficulty. I know you express from time to time the desire for packers to have uniform carcass grade and weight buying programs. Yet, values from similar hogs are different in different companies and different plants in the same company. Besides obvious value differences due to location, there are differences due to the merchandising abilities of firms and the kind of plant we are talking about. Let us assume that one firm has developed a good business for merchandising lean and meaty pork loins but has a poor bacon business. This packer has to buy loins from other packers and sell bellies to balance his slaughtering and merchandising operations. Another firm has only a normal loin business but sells a high volume of bacon. Both operate hog slaughtering plants in the same area. What is the value of loins and bellies from the cut operation in these two plants? In the former, are meaty loins worth what it would cost the plant to buy them from another plant and pay for the handling, boxing and transportation costs? Are the bellies worth what they will bring in the market minus the expense of handling, boxing, and transportation? This would seem to be true. In the second company, it would seem that the loins are worth less and the bellies more. This has obvious inferences in pricing hogs for live or carcass grade and weight. In the first company where loins are more in demand, their meaty, lean No. 1 hogs would be worth considerably more than less meaty

No. 3 and No. 4 hogs. In the second company, No. 1 hogs would not command the value difference over No. 3 and No. 4 hogs. In the second company, No. 1 hogs would not command the value difference over No. 3 and No. 4's; because of them, loins are worth slightly less and bellies, slightly more.

This is only one example of the many "transfer" problems we have in pricing. In your studies of pricing in this industry, I suspect the assistance of your best cost accounting colleagues will prove necessary. We can have the most beautiful pricing systems imaginable, but if producers don't know what it really costs to produce different qualities of livestock or packers and retailers don't know what it costs to market different kinds and qualities of meat, the pricing system won't guide consumption and production like we think it should.

Another big problem in pricing with pork packers is that of maintaining good, accurate standard yields of product from various weights and grades of carcasses at low cost. It is time consuming and expensive to run good cutting tests. And what we are attempting to measure continually changes. Results are changed by changes in carcass breaking, trimming, and cooler shrink to name a few. They are changed as hogs continue to change over time. There are also seasonal differences and differences due to geographic location, distances livestock are hauled, and methods of livestock marketing. If you or your colleagues in Statistics, Industrial Engineering, Accounting, or any other discipline can help us to develop less costly and quicker methods of keeping our yields up-dated and accurate, it would be very helpful. I suspect retailers may have somewhat similar problems and needs.

Communication

Much of the concern in communication in livestock marketing seems to be how to get accurate and timely reporting of the markets in an industry where more and more livestock are moving directly from feeders to slaughterers. I think the problem is real. I don't know, nor have I seen studies on how real livestock feeders think the problem is. Before we get too pessimistic, I believe, and I don't recall this mentioned today, that the increase in good and timely information on quantities of livestock moving in the market is very beneficial to all parties and to marketing efficiency. Public data on not only terminal receipts but country marketings, by important states, and the release of daily Federally inspected slaughter, by specie, are all important in helping the market reflect and adjust to conditions. There are, as was stated and as would be expected, close relationships between variation in receipts and slaughter and variation in prices. All participants in the market should and I believe do place much emphasis upon communications concerning these "quantities". In some ways, these quantity data can direct and influence short-run marketing decisions as well or better than price data, since by the time we get price data to the participants, they cannot take advantage of these prices.

Attention to these quantity data has helped, I believe, to reduce day-to-day price fluctuations in the hog market. Practically all the hogs our company slaughters are purchased in country markets in Iowa, Illinois, and Wisconsin, with smaller amounts in Missouri and Minnesota. The average day-to-day change in the price of hogs we purchased in fiscal 1968 (52 weeks

ending October 27) was $.16 per live cwt. The median daily price change was $.14 per live cwt. These prices were adjusted for differences in average weight.

The average day-to-day variation in the cost of the hogs we purchased was actually slightly less than the average day-to-day variation in pork prices during fiscal 1968. Using daily pork transfer prices and our Madison plant cutting standards, the average day-to-day variation in the value of pork from No. 2 grade, 210-219 pound hogs was $.17 per live cwt. These data are shown in Table 1.

Willard Williams and others have expressed concern that the trades reported by the National Provisioner are too few to accurately reflect supply and demand changes. But, apparently, the "sheet" on pork prices does move enough so that we find that the composite of pork prices varies as much from day-to-day as do hog prices in the country.

In further comment on Williams' concern, we feel that for pork and beef that the National Provisioner is quite accurate on items which are traded often -- the middle weights and the popular grades. However, we believe it less accurately reflects values in weights and grades or products which are not traded frequently or in large volume. For the latter products, we are hesitant to sell or buy meat products in the future on a formula based on the "Yellow Sheet." Data on Tables 2 and 3 gives us an idea on the frequency and magnitude of day-to-day and week-to-week changes in the prices of a selected sample of pork prices. For the most part, these are pork items for which there are many and frequent trades.

In speaking of communications, the fact that practically all packers I know use the National Provisioner and seldom if at all use the USDA or Federal-State reports on meat prices even though the former is expensive in direct cost of us and the latter is distributed at no cost to us, tells me that there must be something in content, format, speed, accuracy or other characteristics that the USDA reports lack. Perhaps the USDA reports try to do too much at too many locations for too many different qualities of product and don't accomplish as much as the private source in sticking to closing trades with a more narrow quality range and adjusted to one location. I have heard one of our managers complain that the format of the Federal and Federal-State reports were not the same at different locations and thus made them more difficult to read and to compare. With time a more scarce and expensive resource for managers on the farm, in the packing plant and at retail, the format of these reports must be given attention.

A somewhat similar problem exists, I believe, in federal and state livestock price reports. In some kinds of markets, particularly terminals and auctions, hog prices reported are prices paid by packers, while in country markets, prices reported are prices actually received by farmers. This might cause some misinterpretation by producers or others who may not be aware of important differences in markets such as different marketing charges, differences in shrink incurred because of differences in shipping times and distances and differences in weighing times and procedures. Since these factors are so important to interpreting prices at a particular location, it would seem that they should be part of the report.

Summary and Concluding Remarks

I have tried to direct my comments to several areas of what we need to know all the implications -- social and economic -- of changes and of "shortcomings" (as we measure them) of our pricing system. Perhaps the economic inefficiencies in the narrow sense are seomtimes offset by social benefits. I believe that we need better cost accounting at all stages to really fully utilize our pricing system. At the packer level, a better, lower cost system for obtaining and updating standard yields of fresh cuts would be helpful.

In communications, we need to continue to improve public reports. This includes not only daily livestock and meat price reports but also reports of quantities marketed and quantities to be marketed such as daily receipts at different kinds of markets -- terminals, country, etc., daily slaughter, Cattle on Feed Reports, Hogs and Pigs Reports and so on. Erratic supply response and prices from day-to-day are costly. But it is possible that with a biological product such as livestock, with long production to marketing time lags, that the larger economic losses occur because of exaggerated cyclical and seasonal variability in production and marketing in response to fairly uniform consumer demand for meat.

There are several other general thoughts that I had in reading the papers and listening to the discussion. We should be sure to see that we are using our scarce resources to analyze our most severe problems. Are we paying as much attention to pricing and communication inefficiencies in products which a livestock producer buys for his enterprise such as housing, machinery, breeding stock, feeds, etc.? What are the effects of inefficiencies in this area compared with those existing in livestock and meat marketing? One thing that concerns me is that in most studies I have read there seems to be a much larger variation in cost of production of livestock than variation in prices received for it if we hold time and quality as constant as possible. In what other areas of agriculture, or indeed in any part of our economic system, are there pricing and communications problems which may be larger or more important and therefore more in need of public study?

There are many other interesting topics which we could discuss if time would allow. Let me say that I have thoroughly enjoyed being a small part of your program and of your day and have been impressed by the content and quality of your Committee and its seminar. As you realize by now, I am also impressed with the pricing system which exists in livestock and meat and the tremendously efficient job it does in guiding our productive resources and the consumption of meat products. I believe our public and private communication devices are good but that there can and should be continued efforts to improve them. I share your interest and concern for the pricing and communication systems and your attempts to help them to function as well as possible to serve society's needs. I have enjoyed and profited from your program and thank you for inviting me.

Table 1: Daily Changes in Hog Prices and Pork Prices, Fiscal, 1968

Daily Change (live cwt.)	Hogs 1/	Pork 2/
$ .50 or more	6	7
.40 - .49	6	11
.30 - .39	18	23
.20 - .29	60	48
.15 - .19	34	34
.10 - .14	34	28
.05 - .09	51	44
.00 - .04	45	59
	254	254
AVERAGE	.16	.17

1/ Average cost of hogs procured by Oscar Mayer & Co. adjusted for changes in average weight.

2/ Average value of carcasses from hogs grading No. 2 and weighing 210 - 219 pounds at Madison, Wisconsin.

Source: Internal records, Oscar Mayer & Co.

Table 2: Daily Price Changes of Selected Pork Cuts, Fiscal 1968 -- 52 Weeks Ending October 27, 1968

Price Change (Dol. per Cwt.)	16/18 Hams	12/14 Bellies	3/dn Spare Ribs	1½/3 Blns. Butts	6/8 Picnics	50% Trim	14/dn Loins	Loose Lard
0	57	71	162	203	123	149	48	218
1/16	1	0	0	0	0	0	0	0
1/8	2	11	0	0	7	19	0	31
1/4	43	43	19	7	38	32	50	4
3/8	2	5	1	0	1	3	0	0
1/2	68	53	39	29	60	30	46	0
5/8	5	3	0	0	1	4	0	0
3/4	26	21	8	1	9	6	25	0
7/8	0	1	1	0	1	0	0	0
1	34	30	16	9	11	7	33	0
1 1/8	1	1	1	0	0	0	0	0
1 1/4	4	6	0	1	1	1	10	0
1 3/8	0	1	0	0	0	0	0	0
1 1/2	6	6	5	1	1	1	16	0
1 3/4	0	0	0	1	0	0	6	0
2	4	1	1	1	0	0	6	0
2 1/4	0	0	0	0	0	0	5	0
2 1/2	0	0	0	0	0	0	2	0
3	0	0	0	0	0	1	0	0
3 1/2	0	0	0	0	0	0	2	0
4	0	0	0	0	0	0	3	0
4 1/2	0	0	0	0	0	0	1	0
	253	253	253	253	253	253	253	253
AVERAGE	.496	.435	.230	.128	.248	.183	.735	.019

Source: National Provisioner

Table 3: Range in Prices of Selected Pork Products from Friday to Friday (Five Market Days) -- Four Fiscal Years, 1965 - 1968

Price Variation Per Cwt.	16/18 Hams	12/14 Bellies	3/dn Spareribs	Bnls. Butts	6/8 Picnics	50% Trim
	NUMBER OF WEEKS					
$ .00	0	2	56	93	8	43
.01 - .49	3	8	9	4	18	20
.50 - .99	30	36	49	33	58	47
1.00 - 1.49	55	40	36	45	54	43
1.50 - 1.99	38	35	24	11	36	27
2.00 - 2.49	30	29	14	8	19	6
2.50 - 2.99	21	18	6	3	9	7
3.00 - 3.49	11	15	6	8	5	10
3.50 - 3.99	6	9	3	0	1	1
4.00 - 4.49	4	8	2	1	0	2
4.50 - 4.99	3	2	0	0	0	1
5.00 - 5.99	1	6	2	2	0	1
6.00 - 6.99	3	0	1	0	0	0
7.00 - 7.99	1	0	0	0	0	0
8.00 - 8.99	0	0	0	0	0	0
9.00 - 9.99	1	0	0	0	0	0
10.00 -10.99	0	0	0	0	0	0
11.00 -11.99	1	0	0	0	0	0
TOTAL	208	208	208	208	208	208
AVERAGE	$1.86	$1.81	$0.97	$0.68	$1.11	$0.96

Price Variation Per Cwt.	14/dn Loins (No. of Weeks)	Price Variations Per Cwt.	Loose Lard (No. of Weeks)
$ .00	4	$0	37
.00 - .99	17	1/16	5
1.00 - 1.99	59	1/8	75
2.00 - 2.99	44	1/4	41
3.00 - 3.99	34	3/8	10
4.00 - 4.99	22	1/2	21
5.00 - 5.99	13	5/8	9
6.00 - 6.99	7	3/4	1
7.00 - 7.99	1	7/8	3
8.00 - 8.99	5	1	3
9.00 - 9.99	0	1 1/8	2
10.00 -10.99	1	1 1/4	1
11.00 -11.99	1		
TOTAL	208		208
AVERAGE	$2.77		$0.24

Source: National Provisioner, Price variation shown is the difference between the highest and lowest price quoted from one Friday market close to the next Friday market close (five market days, six Provisioner reports.)

COMMUNICATIONS AND PRICING -- WHAT WE KNOW AND WHAT WE NEED TO KNOW

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Since this is the appraisal and commentary portion of the seminar, I will draw in part upon the previous papers in this section. I'll try to summarize some of the things we seem to know or agree upon concerning pricing and communications in the livestock market and review the problems, needs, and possible future developments in this area as discussed by previous speakers. In the process, I will also comment on a few points that have not been discussed previously.

What We Know about Pricing Efficiency

First, let me review some of the things that we seem to know or otherwise agree upon. I'm sure there is general agreement on the conceptual role of prices in our economic system; and, therefore, on the need for accurate pricing of livestock and meat products. While this role can be verbalized in a number of ways, it is basically that of directing the allocation of productive resources in a manner that will accurately reflect the relative preferences and demands of final users. The ultimate in pricing efficiency then, under perfectly competitive conditions, would result in the marginal cost of the supply of goods being exactly equal to the marginal satisfaction received by buyers.

The need for complete information and effective communications about such things as consumer preferences, supplies, and prices is obvious if accurate signals are to be transmitted through the marketing system between consumer and producer. Since prices are dependent upon the accuracy and completeness of the information on which they are based, incomplete or incorrect information leads to inaccurate pricing. And inaccurate prices transmit an incorrect message to participants in the production-consumption continuum.

It's easy to define in idealistic and theoretical terms what prices are supposed to do in our livestock marketing system. But, it's obviously much harder to identify the degree to which price inaccuracy exists, the specific reasons for its existence, the best prescription for improving pricing accuracy, and the appropriate means to implement new approaches and procedures to more nearly achieve the performance desired. These questions have been the subject of today's session.

I think it has been fairly well established that pricing inaccuracies do indeed exist in the livestock-meat industry, both on live animals and meat. And we've identified some of the reasons for these inaccuracies, as they occur in the present marketing system. In rather broad terms, most of the pricing errors seem to relate to one or more of the following:

1) Inability to accurately identify quality and yield.

2) Problems of price discovery in direct exchanges of livestock between individual producers and buyers and in livestock transfers under new marketing and pricing systems and procedures.
3) Incomplete availability of relevant market information and poor communication within the livestock marketing system.
4) Marketing practices that are outmoded or which reduce the operational efficiency of the actual exchange operation.

Pricing Errors Due to Grading Deficiencies

Tom Stout's paper provided a good discussion of pricing inaccuracies which result from grading deficiencies or the inability to accurately identify quality and yield. Pricing on the basis of live evaluation of quality and yield is still the predominant method of establishing market value. Under this situation, the inability of graders and buyers to precisely identify the carcass quality and yield (and hence the value) from live observations is a major source of pricing error.

While sale of livestock on a carcass grade and yield basis is increasing, the majority of sales are made without benefit of this more accurate determination of value. And within the grade and yield system, there are additional problems -- related to such things as the amount of cooler shrink, maintaining the identity of individual animals and carcasses, and the sometimes conflicting nature of operational efficiency and pricing efficiency goals.

Although still a major source of pricing error, there has been considerable progress in this area. Grading improvements are an example -- including the addition of yield grades for beef (similar changes are in the proposal stage for lamb), and revisions of pork standards. Also, more livestock is being sold on a carcass basis. In 1963, 7.9 percent of cattle purchased by packers were bought on a dressed basis; by 1967, the proportion had risen to 14.4 percent. And, in some areas, the proportion sold on carcass evaluation methods is much higher; for example, on October 29, 1965, the weekly summary of direct cattle sales in Iowa and Southern Minnesota reported, "cattle bought on a carcass basis accounted for about 26 percent of the week's total supply." Three years later, on October 25, 1968, the weekly summary read, "Cattle bought on a dressed basis, 44 percent of the week's kill."

Many cattle bought on a so-called "dressed" basis are not evaluated for yield, so are actually priced on the basis of carcass grade and weight. Additional adjustments in grading standards and procedures may be needed, if the grade and yield pricing is to show rapid expansion. And certain operational inefficiencies remain to be solved, tighter P & S regulation of carcass methods of selling may also develop. With these changes, further increase in carcass grade and yield selling is expected. Extension of this method of selling in some form to auctions and terminal markets is one possibility for the future.

Problems of Price Determination

Problems of pricing livestock and meat under new forms of exchange appear among the toughest facing the livestock industry. Further increases in direct

marketing, in sales on a carcass grade and yield basis, in contract sales to packers in integrated production operations, and in formula pricing at wholesale present problems in both price discovery and price reporting. We apparently know little about the extent and magnitude of pricing errors in these transactions. But we are probably safe in our assumption that they exist. Richard Kohls described the nature of these developments as follows: (68)

> There is a proliferation of price discovery at the raw product levels and the reduction of such points at the processor-wholesaler-retailer levels..... The exchange process is increasingly taking place through individual isolated agreements between two interested parties..... Whenever title exchange takes place, decisions must be made as to the value of the particular product at that particular time and place. Increasingly, the food system is using a system of formula relationships tied to specific quotations of the old terminal system to arrive at proposed exchange price levels. This occuring at the very time that the validity of such price levels is increasingly under question.

The problem of price determination in the livestock and meat industry was also aptly described by the National Commission on Food Marketing: (40)

> The pricing of livestock and meat historically has been a relatively imprecise process. Quality characteristics are difficult to identify and measure accurately. Central markets have declined in significance. These considerations probably have enhanced the development of vertical integration by firms seeking more efficiency in the transfer of livestock and meat from one party to another. But greater vertical coordination has also added to the problem of determining exchange values. And with formula pricing, fast and accurate knowledge of actual supply and demand forces becomes even more difficult to obtain..... Added to these problems of efficiency and effectiveness in discovering equilibrium prices is the associated problem of communicating timely and reliable information about prices. Greater and more accurate product knowledge and market knowledge are needed for this purpose. Pricing and other exchange procedures will require increasing evaluation and supervision, considering the key importance they play in allocating resources and distributing income in the changing livestock-meat economy.

Williams discussed formula pricing of meat in wholesale markets, as well as the "Yellow Sheet", in some detail. This appears to be one of the areas where greater understanding of present practices is urgently needed and where present information and procedures for assuring an accurate pricing base must be either verified or new procedures developed.

Market Information and Communication Problems

As the papers by both Williams and Purcell stress, pricing errors occur because of inadequate market information on which to determine value. Ineffective communication of available market information throughout the marketing system is another source of pricing inaccuracy on livestock. These problems are not necessarily confined to newer marketing methods. For example, lack of relevant market information has long been a problem in

effective pricing of feeder livestock, and feeder cattle in particular. Again the extent of pricing error attributable to these deficiencies is hard to estimate quantitatively, but I think there is little doubt that it exists.

Purcell's paper does an excellent job of discussing the communications process in the beef market and identifying possible sources and reasons for communications deficiencies. In the communications theory framework of Source, Message, Channel and Receiver, I suspect that some of the problem lies in the message itself. Much of the information in the market news message, the SRS livestock estimate, the outlook statement, etc., may not be relevant to the real decisions that are made; or it may be presented in a form that is not readily comprehensible to the decision-maker. A part of this problem is no doubt related to the need for a broader perspective, as mentioned by Purcell. The relevance of much available market information simply isn't recognized by potential users.

Marketing Practices and Pricing Efficiency

Certain marketing practices also contribute to pricing errors. The use of pencil shrink in the transfer of both feeder and slaughter livestock is one example. Lack of uniformity with respect to fill and other weighing conditions are others. Inefficiencies in the physical processes of livestock exchange are other possible sources of pricing inefficiency. The extent and magnitude of these errors have and can be quantified on an individual case study basis.

What We Need to Know

Many of the problems on which additional information is needed and on which research and study should be focused have been identified in the preceeding papers. Some of these are reiterated here, along with other possible gaps in the tools, information and knowledge needed for effective pricing of livestock and meat.

About Quality and Yield Identification

There's been significant improvement in our grading standards and procedures for identifying and classifying quality and yield attributes of livestock. However, additional effort is needed toward the development and use of more objective grading standards for hogs and cattle. Perhaps there is even greater potential for improving pricing accuracy through wider usage of existing grade standards in livestock and meat marketing.

About Price Discovery Problems

Earlier papers expressed the need for an accurate basis for pricing at wholesale, in carcass grade and yield selling, and in some other cases of direct selling. Price determination for livestock sold on contract or produced in some form of integrated operation can also be difficult. What is the appropriate price registering point and pricing base? What marketing information is needed, how to obtain it, and what are the most efficient means of communications. These are among the questions that need to be answered. We need also to know more about the exact nature of formula pricing of meat -- how it's being done, how the "Yellow Sheet" is used, the adequacy of "Yellow Sheet" information, the accuracy of pricing, etc.

Ways to accurately measure for shrinkage on live animals and carcasses and retain an acceptable level of operational efficiency is another need for more accurate pricing.

Aside from the question of price discovery under emerging marketing systems, Trelogan has raised another point for deliberation.(139)

"What can be reported as a valid price received by a "farmer" enveloped in an integrated enterprise, where can one ascertain prices paid in units and terms comparable with other farmers, how can contractual terms be convered to standardized prices suitable for aggregation and averaging?"

So not only are there potential problems in finding a realistic basis for determining contract prices, as well as carcass grade and yield sales in some cases, but there is the very real problem of providing a mechanism for registering these transaction for market news purposes and for incorporating them into proce series needed both for historical record and for policy formulation.

About Market Information and Communication

Changes in marketing methods and pricing procedures are demanding adjustments in the kind of market information needed for pricing and as a guide to marketing decisions. We need to know what kinds of information are needed to facilitate accurate pricing of livestock sold under contract, under carcass grade and yield procedures, and even under direct selling methods that have been in use for many years.

At the farm level, there is need for greater understanding of the relationship between wholesale prices and live values. One common source of misunderstanding relates to by-product values and how, if at all, they enter into packer bids for cattle on a dressed basis.

There should be more effort to tailor the content and form of market information to the needs of users. Williams made a strong reference to the need for a visionary look at the kind of market news system that will be needed in the livestock and meat industry several years from now. At the same time, more study of present market news requirements and more flexibility in adjusting to changing marketing procedures are needs of a more current nature.

We need to remove barriers to effective communication of market information and determine the channels that most nearly meet the needs of the various segments of the industry. Greater effort to provide for feedback within the marketing system is also needed -- from marketing firm to producer, from consumer to producer, etc.

Some of the deficiencies in channels of communication are being removed by a variety of electronic and telephone recording devices. For example, the market news department at Iowa State University at present maintains three telephone-recording devices that can be called at any time for market information on feeder livestock, slaughter livestock and grains. Information

is updated several times a day; and a three-minute report is available whenever needed. Thus access to this timely information is not restricted to a rigid radio broadcast schedule that can be easily missed. Similar market news devices are in use in many other locations around the country.

Another example of what may be ahead in this area of communications is a proposed computer-controlled market information service for the broiler processing industry. This system was recently approved by the Federal Trade Commission. This service will provide instant information about market conditions for broilers at any time. Utilizing information called in by processors on their sales and supply position, the system will report which markets have large supplies, how many loads are enroute to a market, current prices, etc.

About Marketing Practices

Although it's an old and unexciting problem, we need to know more about shrinkage -- how much occurs, quantitative relationships between amount of shrink and causal factors, and how to price livestock to accurately reflect actual shrinkage losses.

Meat merchandising practices at wholesale and retail are sources of pricing error, some of it due to the relative independence of the different distributive levels in the marketing system. Failure of retail prices to fully reflect changes in live and wholesale supply-price conditions can transmit an incorrect price signal to consumers. Consumer reponse to these somewhat artificial market conditions then relays a distorted message back through the system to producers. However, from the retailers position, there is no compelling reason to keep the retail price of particular meat items correctly aligned with the most recent changes at wholesale. Other pricing strategy may indeed be more realistic in terms of total store operations.

Livestock Futures Markets

Futures markets in live cattle and hog contracts have added a new dimension to livestock and meat marketing that we need to know more about. The markets provide a means and mechanism for registering known and expected price factors into contract prices for delivery several months into the future. The cattle feeder or hog producer is provided with the option of setting an approximate price for the livestock at the outset of the feeding or production period or at any time during the production process. This is done by selling futures contracts in the appropriate delivery month at the prevailing market price. Whether this is an attractive alternative at a particular time depends upon the individual's evaluation of potential returns from a hedged versus an unhedged position. It may also be influenced by his current ability to carry the risk of a lower price from an unhedged position. The availability of this alternative is dependent upon the existence of flourishing and active futures markets in either the live or carcass markets.

These markets may also provide some potential for long hedging by meat processors who might buy contracts for future delivery and thereby establish approximate paying prices for raw products. The economic incentive for this

type of hedging may be limited, however, by the inability to take similar hedging positions in the product side of the market. Since meat processors characteristically operate on a margin basis, long hedging would appear profitable only if an individual processor's analysis of future market conditions suggested (with a relatively high degree of certainty) opportunities to obtain livestock at levels well below future expectations of carcass-live price relationships.

How does pricing livestock through futures contracts (and under other contract arrangements) rate in terms of pricing efficiency or accuracy? A little reflection on the question leads me rather quickly to the conclusion that pricing errors are likely to be quite high. First, there is a high probability that actual cash price at the time the contract is closed out will be somewhat different than the contract price -- possibly much different. This will indicate an exchange has been made at a level that does not reflect true supply-demand relationships. So extensive hedging use of livestock futures would represent a substitution within the industry of a higher degree of price certainty for a lower degree of pricing accuracy.

Other sales of livestock on contract have the same tendency for pricing error. Largely, it reflects the inability of buyers and sellers to project supply-demand conditions accurately into the future; and, therefore, to reach agreement on a price for future delivery that is precisely correct. Under these conditions, futures prices probably represent a discounted price in the sense that livestock producers who hedge their operations by <u>selling</u> contracts may be willing to accept a price somewhat below their actual cash expectations -- in order to achieve a degree of price certainty. At the same time, speculators expect to buy at a level below their true expectation -- since this is the only way they can expect to profit on such a transaction and as return on their risk capital.

Some may counter with the argument that futures markets have price stabilizing benefits that, over the long run, will lead to more nearly optimum allocation of resources -- by tempering the tendency to overproduce and underproduce in the livestock industry. I think this is a difficult position to defend empirically, although a theoretical case for such performance can be developed.

It appears that two of the newer developments in the livestock industry -- increased production and marketing under contractual agreements, and the introduction of livestock futures markets -- can be quite complementary. The person or firm that buys livestock under a contract arrangement can presumably acquire price protection on the purchase by an offsetting sale of futures contracts. But both developments seem to work against greater pricing accuracy for livestock.

This does not mean that our quest for greater pricing accuracy justifies criticism of marketing innovations that do not contribute to this end. It does suggest that other objectives, such as price certainty, are also relevant. Our objective of economic efficiency in livestock marketing and pricing must be blended with other goals and constraints present in a particular decision-making environment.

A FRAMEWORK FOR EFFECTIVENESS IN THE FUTURE

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NCM-36, the denouement of which is being observed today even as NCR-61 is being initiated, set a grand record of research performance.

The livestock and meat economy has long been a favorite point of reference in many scholarly works in economic theory. The cattle cycle alone has been mined for much knowledge of the nature of all investment cycles. It is by no means happenstance that the livestock and meat economy has lent itself so well to conventional economic analysis and research. In the language of Thomsen and Foote, the livestock and meat economy has conformed to established ideas as to both price determination and price discovery.

Several conditions are met. With respect to determination of value, the final product is important enough to engage a discrete calculus on the part of the consumer. Meat is perishable, so that valuation repeats itself fast. Products are clearly identifiable. The basic value-determining forces are isolatable. There is no great non-price competition. The product maintains identity throughout the marketing sequence. For the most part, the condition of multiple firms in buying and selling at the several levels is met reasonable well.

Institutions for price discovery also fit the classical pattern. There is open interchange among many factors in the various markets; pricing tends to be uniform to all parties; there is fairly open entry; product tends to be homogenous; an elaborate system of information attends the entire process; and tighter market regulations are enforced on livestock and meat trading than on the marketing of any other product.

In reading the various papers prepared for this seminar, I sensed that the authors recognize that the institutions of livestock and meat marketing have in fact accommodated our expertise. They also note that this comfortable setting is slipping away. Responses are varied. I must associate myself with those who believe that changes underway are drastic and fundamental. They are not mere modification on the older system.1/ In applying our skills

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1/ May I suggest a viewpoint that has grown on me. It is not one that can be proved in any statistical sense. I am about ready to generalize that in all the economy if not in all society, certain persons and institutions and practices become virtually a proxy for a larger body. Most of us as citizens, for example, are beneficiaries of those individuals who give leadership to political parties, who fight for good government, etc. In livestock marketing, there must be a central value determining mechanism if we are to have an exchange system. Total decentralization is bedlam, and unworkable. Even as central markets fade out of the limelight, I find it necessary to defend their significant role. They have served as the price making mechanism, or a big part of it, for a much larger volume of trading than actually takes place on the markets themselves.

to whatever marketing arrangements emerge, a basic rule to follow is that of avoiding particularization. To be sure, it is necessary to examine the system sector by sector and even to set up some norms for each sector. But we must remember that the final judgment can only be a system-total judgment. Further, it must include both the so-called pricing efficiency and operating efficiency considerations.2/

But when we look into various kinds of arrangements or systems in marketing, we also need to remember that criteria for them are not exclusively economic. Over many generations we have built into our marketing institutions various protections of socio-political meaning. This applies to uniformity in pricing, and rejection of any kind of discrimination or rebate. Open entry is of the same quality. One of the objections to direct selling is that small and large sellers cannot be treated as nearly equally as they are on a central market.

Always, the central focus in livestock and meat marketing research is valuation. Valuation for the purpose of guiding product to consumers and for the purpose of allocating resources for future production. This comes ahead of all operating aspects of the system.

In my view, we seem to be moving away from centralized determination of price and into a more decentralized system. Moreover, I believe we will edge toward more conventionalized price making in lieu of negotiated pricing in connection with exchange of ownership. Let us consider, for example, carcass grade and yield selling. The temptation will be great to sell not on a negotiated carcass price but on a formula or realized price of some kind. Negotiation will then be confined to various margins or deducts. These will become standardized and negotiation will vanish.

Although evidence is not consistent, it appears that a high fraction of all beef trading east of the Rocky Mountains is done on the basis of a formula price, often the Yellow Sheet. The meaning of all aspects of formula pricing deserves careful research. It seems to me that formula pricing is miles removed from negotiated market price. It might be "computerized" as some persons propose, but still it defies satisfactory conceptualization. For one thing, it is only a base price for negotiation and not a final price as such. Where does it come from? I tend to think of it as a kind of public utility service. Its origin is necessarily highly personalized, yet it is the fulcrum on which an entire industry does its business.

2/ An illustrative case relates to resistance by some parts of the system to dual grading of beef. Individual firms or even sectors that opposed dual grading may have been justified from their particular points of view, but it is doubtful that the proposal would fail of defense when viewed in system-wide perspective. Or take packers' buying of hogs "on the average". Their dollars paid may be no different but pricing efficiency is certainly poorer than if hogs are sorted and priced differentially.

If I am correct in thinking that there must be some kind of a central pricing mechanism, a serious question is raised as to what form of institution for pricing would be desirable. The work done by research economists on the egg industry may be worth our attention.

It has seemed to me that livestock producer organizations ought to take more interest in these issues as to a marketing and pricing system for the future. To date, they have shown some alarm but little responsible action.

Although several remarks above were directed to changes, even to deterioration, in price making for livestock and meat, a related subject is that of the changing structure of the business units in the marketing system. To date livestock slaughter, for example, has not conformed to the general trend in the economy toward mergers including conglomerate mergers. Meat packing is the only industry in the entire food processing sector that has shown deconcentration. But trends cannot be extrapolated indefinitely; and there is evidence that meat packing will go the way of all food processing. Recent conglomerate acquisitions are strands of evidence.

And if this happens, research economists will face the frustration that research in other food fields has met. The whole arena of cost, price and efficiency studies becomes much more difficult if indeed those studies are feasible at all. Moreover, more attention will be necessary to external economies and diseconomies, as the internal economics of the firm fails to encompass all economic considerations.

In that regard, let me repeat a familiar comment on the popular economy-of-scale studies in food processing. Whenever a firm becomes large enough that the pricing of its inputs becomes imperfect (that is, has a slope to the curve) external economies or diseconomies must be considered. If a firm becomes large enough locally that it must reach farther and farther for raw material but is enough of a monopoly that it can force down the prices to distant suppliers, the additional cost of transport must be built into the study irrespective of whether that cost is a part of the cost structure of the firm.

Sum-up

In no part of agriculture have the operations of an economic sector been so exposed to view, and so expertly viewed, as in livestock and meat. The sector lends itself to analysis and agricultural economists have not missed the opportunity. The result has been a major contribution not only to economic knowledge about the sector but also to development of skills of economists and to formulation of more general propositions -- such as the cattle and hog cycles.

But structural changes can make uncomfortable demands in our search for understanding in the future. Future research may call for renewed imagination, ingenuity, and innovation. As the marketing system departs ever farther from

the perfectly competitive structure, it will be more difficult to make the observations necessary for accurate research findings. More than that, if in fact market firms become larger and more conglomerate, more of the economic phenomena will be internal to the firms; and very often there will be reluctance on the part of those firms to reveal data. One consequence may be to put more burden upon mandatory sources of data, as in reporting to the P & S Administration.

The marketing system of the future will stimulate some difficult questions about policy for marketing, including both the kind of trade practice rules that will be necessary and even rules as to reporting of data needed for a flow of information. I suspect the National Food Commission was correct when it said that it will be necessary to require certain reporting of data on market operations. Voluntary reporting will be less attractive in the future than in the past.

On occasion I conclude that the marketing system of the future will take one of two possible forms: a wholly contractual system in which pricing for live animals disappears; or an industry-wide negotiated pricing arrangement somewhat similar to pricing of fluid milk. The latter would fall in the category of bargaining. In either case, or in any other prospect for the future, major, even revolutionary, changes in the structure of marketing will take place.

Hence the call for imagination, ingenuity, innovation.

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